The Role of Structural Factors in HIV Transmission in Uganda: a Multi-Level Analysis

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THE ROLE OF STRUCTURAL FACTORS IN HIV TRANSMISSION IN UGANDA: A MULTI-LEVEL ANALYSIS

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ABSTRACT

Since the early 1980s, Uganda has been in the spotlight of global concerns about the HIV/AIDS epidemic that has almost brought the country to its knees. Consequently, a number of social epidemiologists and researchers from different social science fields have, over the past two and half decades, focused their attention on Uganda, attempting to identify the risk factors that expose people to HIV infection in order to inform intervention policy. Although studies coming out of this effort have provided important insights into risks of HIV infection, they have been criticized for almost entirely focusing on individual behavioral factors, such as prostitution and inconsistent condom use, as the primary causal factors of HIV infection, without comprehending the contextual background in which HIV infection takes place. Using the 2000/01 Uganda Demographic and Health Survey and employing multilevel logistic regression methods, I address this concern by investigating the influence of contextual factors on three behaviors related to the risk of HIV infection (HIV testing, multiple sexual partnering, and inconsistent condom use). Analyses reveal that educational attainment, socioeconomic status, and

religion significantly predict HIV testing, multiple sexual partnering, and condom use for both men and women – and at both the individual and neighborhood levels. Analyses also reveal that age has an inverted U-shaped association with HIV testing and multiple sexual partnering for both men and women at the individual level. Despite important gains in slowing HIV infection rates over the past two decades, Uganda's increasing burden of the HIV/AIDS epidemic – amid faltering healthcare and other social services investments - is inevitable. It is apparent that there are formidable obstacles to effectively eradicating HIV/AIDS, unless essential social services – such as education, accessible healthcare services – are enhanced, and policies are introduced to improve socioeconomic status of individuals and entire neighborhoods.

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CHAPTER ONE: THE CHALLENGE OF HIV PREVENTION IN UGANDA: Bringing Context Back into HIV Epidemiology

Introduction:

From the early 1980s to the mid 1990s, Uganda was in the spotlight of global concerns about a then emerging epidemic — HIV/AIDS. The rate of infection in the country bewildered the world, as reports of exponential rates of infection filled both national and international news (The Star, 1985; Sserwadda et al., 1987; Echolm, 1990; Hooper, 1987; 1990; Uganda Ministry of Health [MoH], 1991; Cohen, 1993; TASO, 1999). For example, on December 29th, 1985, the front page of the Star newspaper in Toronto started with the title "Mysterious Disease Kills 100 People in Rakai [town in Southwestern Uganda]". But an excerpt from the paper by Sserwadda and his colleagues (1985) sums up the panic and enigma in both the country at large, and among social and health professionals, at the time:

> "A new disease has recently been recognized in rural Uganda. Because the major symptoms are weight loss and diarrhoea, it is known locally as slim disease… and affects females nearly as frequently as males. The clinical features are similar to those of enteropathic acquired immunodeficiency syndrome as seen in neighboring Zaire [current day Democratic Republic of Congo]… Slim disease occurs predominantly in the heterosexually promiscuous population and there is no clear evidence to implicate other possible means of transmission, such as by insect vectors or re-used injection needles. The site and timing of the first reported cases suggest that the disease arose in Tanzania."

The puzzlement expressed by Sserwadda and his colleagues enveloped the country, the region, and the world, attracting attention to Uganda in a search for answers to this new bewildering challenge. Among others, a record number of social epidemiologists and researchers from other social science fields have, over the past two

and half decades, focused their attention on Uganda -- attempting to identify the risk factors that expose people to HIV infection, in order to inform intervention efforts and policy (Sserwadda et al., 1987; Hooper, 1990; Mulder, et al., 1995; Asimwe-Okiror, et al., 1997; Tarantola and Schwartlander, 1997; UNAIDS, 2000; Kamali, et al., 2000; 2002; 2003; Mbulaiteye, et al., 2002). Although these studies are important, they have mostly tended to focus on individual behavioral factors, such as prostitution, inconsistent condom use, and frequent sexual partner change (multiple sexual partnering) as the primary causes of HIV infection, without comprehending the social, cultural, political, and economic contexts in which HIV infection takes place.

Mitigating the burden of the HIV/AIDS epidemic, which continues to ravage the population in Uganda and elsewhere, will require an urgent shift from the narrowly focused model of the individual as the main actor in the HIV prevention arena, to a framework that examines individuals and individual behavior as a function of both individual and contextual influences. Indeed, the 2004 report of the Joint United Nations Program on AIDS (UNAIDS) criticized the dominant emphasis on individuals as targets in HIV prevention interventions by also highlighting the centrality of social context in the fight against HIV/AIDS. The report clearly noted that "interventions that are piecemeal and that do not address the contexts in which people live their lives are unlikely to significantly alter behavior or influence the course of the epidemic" (UNAIDS, 2004:10). Researchers on health and health behavior, such as Diez-Roux (1998; 2001) have also

underscored the importance of contextualizing health behavior in order to achieve sustainable health outcomes.

Hoping to contribute to ongoing HIV prevention efforts, this study investigates contextual causal factors of Human Immunodeficiency Virus (HIV) transmission in Uganda, a country that has aggressively battled the epidemic for over twenty years. While the term context may be conceptualized and defined variously, depending on the purpose of a particular research undertaking and/or the nature of the data available to the researcher (Dieze-Roux 2001), context in this study is used interchangeably with the term neighborhood—and they effectively convey the same meaning. Contextual causal factors of Human Immunodeficiency Virus (HIV) transmission, therefore, are defined as neighborhood/contextual factors or characteristics that directly and/or indirectly impede or facilitate an individual's ability to avoid HIV infection-risk behaviors. These factors have been given different names in the literature – such as environmental, societal, or super-structural- often reflecting the disciplines and experiences of the researchers (Sumartojo, 2000; Parker and Klein, 2000).

As noted earlier, in this chapter, much of the existing research on HIV/AIDS in Uganda has focused on individual characteristics and behaviors in determining HIV infection-risk. This individually-focused paradigm has been referred to, by some scholars on HIV/AIDS and disease prevention in general as "biomedical individualism"– an approach where the individual is exclusively perceived to be the basis of risk in disease causation (Fee and Krieger, 1993). The scope of more comprehensive research

aimed at understanding HIV infection-risk and recommend effective prevention measures, however, ought to include the examination of how persons become susceptible to risk or choose protective practices - - and under what contextual conditions individual behavioral choices are related to HIV infection-risk. A more detailed discussion of contextual or neighborhood characteristics, and how they are obtained for this study, is presented in chapter two.

In 2000-2001, Uganda conducted a national survey that included questions concerning behaviors specifically related to the risks of HIV/AIDS. This survey, called Uganda Demographic and Health Survey (UDHS), allows new insights into risk-related behaviors and their social contexts. Of particular interest are three factors: 1) seeking knowledge of one's HIV serostatus[1] (by taking an HIV test); 2) having multiple sexual partners; and 3) inconsistent condom use. The presumption behind interest in knowledge of respondents' serostatus was that individuals who were tested would be aware of their health status and therefore guard against risky behavior. The second question attempted to ascertain sexual activity outside the boundaries of marriage (whether customary, civil, or religious) in the twelve months prior to the survey. The third question asked respondents whether they had used a condom during their last sexual intercourse with someone other than their spouse, in the twelve months prior to the survey.

[1] Serostatus in this context refers to the condition of having or not having detectable antibodies to the Human Immunodeficiency Virus (HIV). A person may have either a positive serostatus (presence of the Human Immunodeficiency Virus in the blood) or negative serostatus (absence of the Human Immunodeficiency Virus in the blood).

Utilizing multilevel analysis methods, and using data from the 2000/01 Uganda Demographic and Health Survey (UDHS), this study demonstrates how contextual factors might influence individual behavioral factors to create the HIV infection-risk environment of high proportions that Uganda has experienced since the early 1980s. The aim is three fold: 1) to contribute to the efforts of refocusing HIV prevention research and policy debates from the largely behavioral approach that has dominated the field for the last three decades to a more comprehensive approach that takes contextual factors into account, 2) identify vital contextual factors that put individuals in situations that ultimately increase susceptibility to HIV infection; 3) use the unique UDHS 2000-2001 dataset as a source for understanding the contextual factors in HIV transmission in Uganda, with its relatively reduced AIDS prevalence, might serve as a model for other developing nations. The study offers significant insights into how large-scale contextual factors, such as socioeconomic status, lack of education, domestic gender power dynamics, and religious composition affect highly localized behavioral practices like unprotected sex, multiple sexual partnering[2], and HIV testing - - which ultimately shape the course of HIV infection-risk. Such an approach should shed light on strategies for the

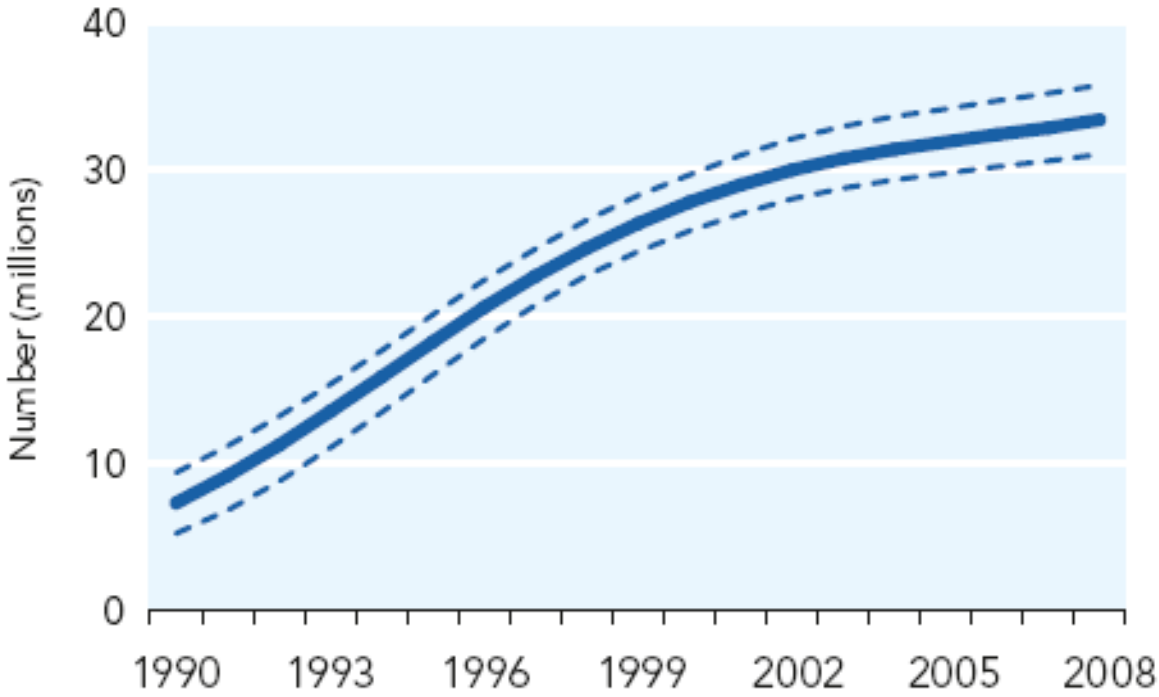
[2] The designation "Multiple Sexual Partnering" describes the behavior of respondents who admitted having had sex with someone other than their spouse/cohabiting partner (whether or not they have a spouse/partner) in the twelve months prior to the survey. Some researchers have argued that "Multiple Sexual Partnering" is not the appropriate language to describe such behavior because some of these individuals might have only had sex with one partner but did not cohabit with this partner, and have suggested language such as "Sex outside Marriage". In this study, however, I use "Multiple Sexual Partnering" to describe the said behavior for reasons of consistence, particularly because it is the language used in the data codebook, and the DHS 2000/01 report.

development of more effective intervention programs in Uganda, in the entire developing world, and in similar populations of wealthy nations, such as the United States.

Demographic Profile of the Global HIV/AIDS Epidemic

Since the 1970s when the first HIV/AIDS case was diagnosed in North America, every decade thereafter has started with world leaders and public health officials pledging to stamp out the epidemic. Yet the 21st century has begun with HIV/AIDS continuing to ravage world populations. According to a recent report of UNAIDS, the Joint United Nations Program on HIV/AIDS, "the number of people living with HIV worldwide continued to grow in 2008, reaching an estimated 33.4 million. The total number of people living with the virus in 2008 was more than 20% higher than the number in 2000, and the prevalence was roughly threefold higher than in 1990" (UNAIDS, 2009:6). Figure 1 below shows the increasing number of people living with HIV since 1990.

Figure 1: Global Estimates of Number of People Living with HIV 1990 – 2008



Source: UNAIDS Epidemic Update, 2009.

The UNAIDS report indicates that the number of people living with HIV has been rising in every region, with East Asia, Eastern Europe, and Central Asia showing record increases. But sub-Saharan Africa continues to suffer the heaviest burden of the epidemic, accounting for 67 percent of HIV infections worldwide, 68 percent of new HIV infections among adults and 91 percent of new HIV infections among children. The region also accounted for 72 percent of the world's AIDS-related deaths in 2008 (UNAIDS, 2009).

The report suggests that the epidemics in sub-Saharan Africa appear to be stabilizing generally, with HIV prevalence at around 7.6 percent for the entire region, but

also cautions that the situation is more complex than a summary perspective can convey. Since 1990, two hidden aspects are noted:

> First, roughly stable HIV prevalence means more or less equal numbers of people are being newly infected with HIV and are dying of AIDS. Beneath the apparent constancy of steady prevalence levels lie devastating realities—especially in southern Africa, which accounts for one third of all AIDS deaths globally. Second, the epidemics in Africa are diverse, both in terms of their scale and the pace at which they are evolving. There is no single "African" epidemic. Some urban parts of East Africa display modest declines in HIV prevalence among pregnant women, while in West and Central Africa prevalence levels have stayed roughly steady at lower levels than in the rest of sub-Saharan Africa (UNAIDS, 2004: 2-3; See also UNAIDS, 2009).

Women are particularly at high risk, and their susceptibility to HIV infection stems not only from their greater physiological vulnerability to heterosexual transmission, but also to the severe social and economic disadvantages they often face. For example, a recent comprehensive epidemiological review undertaken in connection with the modes of transmission in Lesotho found that sexual and physical violence is a key determinant of the country's severe HIV epidemic (Khobotlo et al., 2009), and according to a 2007 survey in the same country (Lesotho), 47 percent of men and 40 percent of women reported that women have no right to refuse sex with their husbands or boyfriends (Andersson et al., 2007).

The HIV/AIDS Epidemic in Uganda

The early 1980s through the 1990s saw Uganda in the spotlight of global concerns about a then emerging epidemic of HIV/AIDS, with reports of exponential rates of infection (Uganda Ministry of Health, 1987; Cohen, D., 1993; Sserwadda D, et al.1994).

Recently, though, Uganda has returned to the international spotlight, this time with reports of declining epidemic levels. Indeed, Uganda has been hailed by many in the international community as one of the most outstanding 'success stories' of HIV prevention efforts (Government of Uganda, 2010; UNAIDS 2005, 2004; Green, et al, 2002; Green, 2003). According to the recent report of the Government of Uganda (GoU) through the Ministry of Health (MoH), the national HIV prevalence rate is estimated to have dropped from about 18 percent to an average of 6.4 percent between 1990 and 2008 (GoU, 2010). Other studies have also reported declining HIV/AIDS levels in Uganda (Gulich and Kaldor, 2000; Kamali et al, 2000; ACP, 2001; 2002; Kamali et al, 2003; Mulder et al, 1995; Asimwe-Okiror et al, 1997; Tarantola & Schwartlander, 1997).

A full explanation of the reported decline in Uganda's HIV/AIDS prevalence rates has yet to be offered, but it is generally agreed that a decline has occurred. Further, there is a level of consensus that this success is the result of aggressive broad-based national policies initiated by President Yoweri Museveni starting in the 1980s. A structured government response to the HIV/AIDS epidemic dates back to the late 1980s when an AIDS Control Program (ACP) was created in the Ministry of Health. The ACP was created from an already existing committee of motivated politicians established in 1985 to promote resource mobilization in the country's economic recovery campaign. The primary mandate of the AIDS Control Program was the provision of safe blood for transfusion and other measures to prevent HIV infection in health care settings. In 1992 a second body, the Uganda AIDS Commission (UAC) was created, by Statute of

Parliament, and placed under the Office of the President. The UAC was entrusted with the coordination of the government response to HIV/AIDS. Alongside these institutions created to aid the health sector in controlling the spread of the epidemic, the government involved religious and traditional leaders, community groups, NGOs (non-governmental organizations), and all sectors of society, building a consensus around the need to control the escalating spread of HIV and providing care and support for those infected and affected (Green, 2003; UAC, 2002).

Despite the optimistic reports, Uganda's HIV/AIDS epidemic is still far from over, and continues to decimate the population at significantly threatening rates. The Uganda Ministry of Health estimated new infections in 2002 alone at 70,170 cases, new AIDS cases at 73,830, and AIDS deaths at 75,290 people. Women are the leading victims of the epidemic, accounting for 55.2 percent of reported adult infections (ACP & MoH, 2003). According to the Uganda Ministry of Health and Uganda AIDS control program:

> The total overall estimated number of people living with HIV/AIDS in Uganda by the end of December 2000 was 1,107,644, down from 1,438,000 in 1999. Of these, 996,880 are adults and 110,880 children of 15 years and below. Aggregated by sex, 543,753 are women and 453,127 males. Uganda's cumulative number of AIDS deaths since the beginning of the epidemic is estimated at 947,552 (December 2001), up from 848,492 in 2000. Of these, 852,797 were adults and 94,755 children. Adult female deaths are estimated at 427,153 and males at 425,644 (ACP & Uganda MoH, 2003: 23. See also, GoU, 2008).

More recent reports, from studies drawing on nationally representative data, coming out of Uganda also seem to support the argument that HIV prevalence may be rising again. For example, according to the 2010 Uganda country report of the United Nations General Assembly Special Session on HIV/AIDS (UNGASS), the current HIV

prevalence in Uganda is estimated at 6.4 percent (indicating a rise from 6.2 percent in 2000) among adults and 0.7 percent among children. HIV prevalence is reported to be higher in urban areas (10 percent prevalence) than rural areas (6 percent). The report also puts the number of new infections at an estimated 111,000 in 2008, exceeding the number of annual AIDS deaths (61,000) in the same year (GoU and UNGASS, 2010).

Analyses of the 2000 and 2001 data from Uganda's HIV sentinel surveillance sites suggest that the epidemic had begun to stabilize then. For example, the 2003 STD/HIV/AIDS survey report indicates that the 2001 antenatal HIV infection rates across all the sentinel surveillance sites, both rural and urban, have confidence intervals that overlap with the confidence intervals for 2000, indicating that there is no statistically significant difference between the prevalence rates. The overall antenatal prevalence rate in 2001 was 6.5 percent, closely comparing with 6.2 percent in 2000. The rates for urban and rural sites in 2001 were 8.8 percent and 4.2 percent respectively compared with 8.7 percent and 4.2 percent in 2000 infections (ACP & MoH, 2003: 22-23).

The report also notes, however, that "HIV/AIDS case reporting continues to suffer from underreporting and the data presented in the report reflect more of the reporting habits than the actual situation in the different facilities in the country" (MoH, 2003, p. 23), and this has not changed much to date.. Even the accuracy of internationally reported levels of decline is questioned by some scholars who challenge the data and methods used to assess the decline.

Some analysts, for example, have cited *'saturation'* to explain the seeming decline in Uganda's HIV prevalence rates. *Saturation* is a state of an epidemic when most of the people likely to be infected have all been infected, thus indicating declining incidence of the epidemic. That is, high mortality obliterates all who are susceptible to infection, leaving only those less susceptible to infection. In such an event, mortality can lead to low rates of HIV incidence for a period of time, until new cohorts become sexually active, when rates of infection rise again (Green, 2003). An important assessment of Uganda's prevalence rates comes from Justin Parkhurst of the London School of Hygiene and Tropical Medicine (2002). Parkhurst argues that the basis for the Ugandan claim of success in reducing the rates of HIV infection has not been sufficiently and critically investigated. While he acknowledges that Uganda has been successful in preventing the spread of HIV-1 in many ways, Parkhurst argues that such success may not be as prevalent as claimed:

> . . . statements of success have often been based on misinterpretation of epidemiological data, and can sometimes not be supported when all the Ugandan evidence is assessed. Furthermore, inappropriate attribution has been made by some as to the causes of any epidemiological changes seen. Such misinterpretation has, in many ways, become an integral part of the story of Ugandan success. … Many claims of the success of Uganda in dealing with HIV/AIDS have been predicated on selective pieces of information, which have been falsely presented as representative of the nation as a whole. These data, however, actually indicate that the decreased prevalence rate often attributed to the whole of Uganda actually arose at only one site, Mbarara (30.2% to 10.5%), though rates in Nsambya and Rubaga also fell sharply. Furthermore, these sites represent only a few urban antenatal clinics--hardly indicative of a nation where about 87% of the population lives in rural areas (2002: 1-5)

The problem therefore may be that successes in reducing infection rates have been generalized upon and that rural programs and populations are underrepresented. Parkhurst's criticism raises the more general question of accurate data gathering in

developing nations and also suggests that researchers should be wary of statistics used as propaganda to showcase national progress.

Why is Uganda Important in the Fight against HIV/AIDS?

Uganda has been internationally acclaimed one of the world's success stories of HIV/AIDS prevention efforts, and is believed to have experienced the most significant decline in HIV rates of any country in Africa and across the world (Green, 2003). These claims have drawn the attention of many HIV/AIDS prevention experts. The question many ask is whether Uganda's model is something that can be replicated elsewhere, particularly in Africa. Given this central place that Uganda has assumed in the fight against HIV/AIDS, it is important to examine all the key variables at play in Uganda's HIV/AIDS epidemic.

In the HIV/AIDS prevention research, both in Uganda and elsewhere, multiple frameworks have been used to explain the epidemic and to shape policy. On one end of the spectrum is the model of microbiology. HIV is caused by a virus understood through the apparatus of modern virology, immunology, and molecular biology and therefore potentially preventable or curable through drugs or other medical technologies. In the middle of the spectrum, it is a disease spread largely through clearly defined patterns of behavior, such as polygamy and inconsistent condom use, as influential factors of HIV transmission. At the macro level, weak economic and political infrastructures, inadequate health services, and other basic human needs fuel the epidemic.

Shaping the policy response to the HIV/AIDS pandemic, both in Uganda and globally, are principally the first two conceptualizations, reflecting both the influence of biomedical and public health approaches to disease in general, and the boundaries of knowledge set by disciplinary enquiry. Conspicuously lacking is an understanding of HIV/AIDS that situates its framework of analysis in relation to the context in which people live and interact (O'Manique, 2004; Sweat et al., 1995; O'Reilly et al., 1996; Bajos et al., 2000; Coates et al., 1990). From a public health perspective, it is imperative to create the groundwork to enable the design of interventions that recognize and accommodate the complex social obstacles that mediate between health interventions and their targets. These realities of disease prevention research must be clearly articulated in Uganda, a country that has become the focus of attention for best practice in the war against the HIV/AIDS epidemic.

Organization of Chapters

The dissertation consists of six chapters. This chapter has introduced the study, delineating the purpose and rationale for the research, situated in existing HIV/AIDS prevention literature. Chapter one also has provided an overview of the HIV/AIDS epidemic both globally, and specifically in Uganda. Chapter two provides a review of the theoretical literature on HIV/AIDS prevention, including a discussion of individual and neighborhood characteristics, and offers a theoretical foundation for the study. Chapter three describes Uganda's demographic and socioeconomic profile, thus providing a clear context in which

the study takes place. Chapter four covers methodology, including a discussion of the data, description of variables, and explanation of the analytical methodology, and more specifically, a discussion of Hierarchical Linear Modeling. I also present tables of the variables included in the analysis in this chapter. Chapter five is the presentation of data analysis results, and Chapter 6 is the discussion of key findings, policy implications, strength, and directions for future research.

In his book, "*Infections and Inequalities: The Modern Plagues,"* Paul Farmer points out that;

> In the emerging literature on emerging infectious diseases, some questions are posed while others are not. A subtle and flexible understanding of emerging infections would be grounded in critical and reflexive study of how our knowledge develops. Units of analysis and key terms would be scrutinized and regularly redefined. These processes would include regular rethinking not only of methodologies and study design but also of the validity of causal inference, and they would allow reflection on the limits of human knowledge (2003:39).

This study is intended as a step in precisely this direction. By challenging researchers to develop theoretical models of disease causation that extend beyond the individual level of human behavior and explore the role played by contextual factors in determining health and disease, the research also offers two sets of theoretical contributions. One is to the new field of the sociology of AIDS and the other is to the social and behavioral science research methodology concerning the prevention of epidemics. HIV infection takes place in a complex environment of interdependent structures and networks into which individuals find themselves without choice – in most cases. Therefore, sound methodology for HIV prevention research needs to address this reality by including contextual variables in the analyses.

CHAPTER TWO: THEORETICAL FRAMEWORK AND LITERATURE REVIEW

To understand the epidemiology of the Human Immunodeficiency Virus (HIV), analyses must focus on identifying motivations and determinants of related human behavior. Social and behavioral theories that utilize a sociological imagination make it possible to conduct investigations that go beyond individual-level HIV infection-risk behaviors to identify relevant contextual/neighborhood factors that shape these behaviors and therefore indirectly elevate or reduce the risk of HIV infection for individuals (Webb, 1997; Caprara et al., 1993; Diex-Roux, 2002).

Individual and Contextual Characteristics

In sociological studies, the interest in accounting for the influence of contextual factors on individual behavior is not new. For example, Emile Durkheim (1951 [1897]) studies the influence of social context on individual behavior, and found that social forces external to the individual influenced suicide. Similarly, Max Weber, in the "Protestant Ethic and the Spirit of Capitalism" (1958 [1905]) illustrated how religious composition and ideology shaped economic behavior of individuals.

Over time, interest in the examination of contextual influences on individual action has grown, both in sociology (Robert, 1999; Link & Phelan, 1995; Phelan & Link, 2010) and in other disciplines such as social epidemiology (Duncan & Moon, 1999; Diez-Roux, 1998; 2001). For example, utilizing multilevel modeling and data from the

British Health and Lifestyles Survey, based on local neighborhoods (wards), Duncan and Moon (1999) investigated whether the characteristics of places play an independent role in shaping individual smoking behavior. They found neighborhood deprivation to have an independent effect on individual smoking status. Their study suggests that the characteristics of neighborhoods play a role in shaping individual smoking behavior. Similarly, this study utilizes multilevel methods, linking individual-level and neighborhood (contextual) characteristics, to explore neighborhood characteristics which may predispose individuals to HIV infection.

Individual Characteristics

Individual-level variables are those that characterize specific individuals, and in this study they consist six independent variables (age, level of education, socioeconomic status, marital status, domestic violence tolerance, and religious affiliation) and three dependent or outcome variables (HIV testing, multiple sexual partnering, and inconsistent condom use). In this sub-section, I first discuss the three outcome variables, followed by the independent variables.

The outcome variables selected for this study (HIV testing, multiple sexual partnering, and inconsistent condom use) have been associated with HIV infection, both in HIV/AIDS awareness campaigns, as well as studies investigating the causes of infection. There are other behavior markers associated with HIV infection risk, such as prevalence of sexually transmitted infections (STIs) and male circumcision (Carael et al.,

2001), but they have not been considered in this study, because the 2000/01 UDHS did not collect data on them.

HIV testing, or seeking knowledge of one's HIV serostatus, is widely accepted in the literature on the HIV/AIDS epidemic as one of the key factors that may reduce HIV infection risk among individuals (Stein et al., 2007; Boerma and Weir, 2005). As a matter of fact, looking into the history of the HIV/AIDS prevention enterprise, it is clear that the discovery of the blood test for HIV antibodies was a significant milestone in the fight against the epidemic. From an epidemiological point of view, this allowed the implementation of the traditional approach to infectious disease control – that is, people could be screened and informed of their serostatus. The logic of this rational choice framework was that if individuals knew their serostatus, they would readily change the behavior that put them and others at risk. However, inherent in this strategy – indeed, the core of its weakness--is the assumption that sexual behavior is fundamentally a function of rational calculation, ignoring the complex power dynamics of sexual relationships, such as gender power disparities and other social context considerations (Fee and Krieger, 2000; Boerma and Weir, 2005; Farmer, 1999).

Multiple sexual partnering has been identified by some social science researchers as an influential factor in the spread of HIV, and consequently, an HIV infection-risk factor. For example, in a study aimed at examining HIV infection in Botswana, Kalichman et al. (2007) found multiple sexual partnerships to be highly associated with HIV infection risk. It is important to note, however, that sexual behavior is self-reported,

and many people regard it as a private matter – which they do not want to talk about in public. In fact, some studies have found conflicting reports on sexual behaviors between husbands and wives, leading to the suspicion that some behaviors are not truthfully reported (Gersovitz, 2005).

Condom use among unmarried/unpartnered individuals has also been cited as a factor that exposes individual men and women to HIV infection, depending on how one uses the condom. It is argued that if a condom is used consistently (i.e., used every time one engages in sexual encounters with someone other than spouse/permanent partner), it safeguards against HIV infection. Condom use has been hallmark of preventing HIV infection among the sexually active population - since the onset of the epidemic in much of the Developing World, including Uganda, although Uganda also has highly emphasized its ABC program (A = abstain, B = be faithful, and C = use a condom) – with the intended goal of having people use a condom as the last resort. Some studies have found strong positive associations between condom use and socioeconomic status, age, and education. For example, in 2006, De Walque explored the determinants of HIV infection and sexual behaviors in Burkina Faso, Cameroon, Ghana, Kenya, and Tanzania and found that individual men's condom use improves as men age (De Walque, 2006). Also, a study utilizing data from the Canadian Community Health Surveys (CCHS) examined condom use among Canadians aged 20-34 years and found that consistent condom use was more likely among younger respondents aged 20-24 (63.7% males; 53.8% females) than those aged 25-29 (56.0% males; 47.1% females) or 30-34 (54.7%

males; 42.2% females) (Rotermann et al., 2009). It is hoped that this study will also find interesting associations between inconsistent condom use and characteristics of individuals and neighborhoods.

The individual-level independent variables selected for this study (age, level of education, socioeconomic status, marital status, domestic violence tolerance, religious affiliation) are all expected to have some kind of association with HIV infection risk and/ or protective behaviors.

Age is an important factor in HIV prevention research. A number of studies have reported significant associations between HIV infection risk behaviors and age (Carael, et al., 2001). For example, a study aimed at examining determinants of HIV infection and sexual behaviors in Burkina Faso, Cameroon, Ghana, Kenya, and Tanzania found that individual men's condom use improves as men age (De Walque, 2006).

Existing literature on HIV prevention and mitigation places education at the forefront of important factors that determine whether people get infected or not (Glick and Sahn, 2007; De Walque, 2006). It is expected that educated people have better access to sources of HIV prevention information through the different available media tools, such as newspapers, billboards, television, the internet, or the ability to visit public health services where HIV prevention information is dispensed.

Socioeconomic status is another important factor, which has been widely identified by existing studies as key individual and contextual determinant of HIV infection-risk behavior, and as well as protective behaviors, such as HIV testing. For

example, Shelton, Cassell and Adetunji (2005) find socioeconomic status to be positively associated with HIV infection-risk behavior in their study on poverty and HIV prevalence in sub-Saharan Africa.

Marital status is believed to play a role in determining HIV infection risk. In Uganda, people have three major paths to marriage: customary marriage, religious marriage, and civil marriage. (1) Customary marriage is a type of relationship where a contract is made between the prospective bridegroom and the bride's father (or authorized guardian). The actual marriage consists of the performance of this contract, where the father or guardian hands over his daughter to the bridegroom, and the bridegroom provides specified customary payments of bride-wealth. (2) Religious marriage involves a religious ceremony of marriage presided over by a religious minister. (3) Civil marriage involves a licensed registrar of marriages performing the marriage ceremony. There is an additional category, however: (4) informal marriage, or cohabitation. People who are cohabiting without having engaged in any of the three ceremonies mentioned above often refer to themselves as married, and are generally perceived as such, even though their union is not legally recognized. In this study, I take marriage in its broadest sense and include all the above categories (see also Nabaitu et al., 1994).

Domestic violence tolerance breeds gender power differentials that may exacerbate the ability to control HIV infection or exposure to it – and could explain vulnerability differences between men and women. Imbalance in domestic gender power, often culminating into domestic violence against women, is one of the factors that are

increasingly being recognized as affecting health-seeking behavior, thus subjecting women to higher risks, including risk for HIV infection. The World Health Organization (WHO) in its 1999 publication on gender, and in numerous subsequent publications, affirmed this when it clearly articulated that violence against women has serious consequences for their mental and physical well-being, including their sexual health. Wife beating is one of the most common forms of domestic violence worldwide, and it is an indicator of underlying gender power dynamics between men and women. Although domestic gender violence related to HIV infection risk has been mostly examined in terms of risk to women's health, a few studies have also found an association between sexual partner violence and HIV infection risk behavior among men. For example, in a study aimed at examining associations between the perpetration of sexual partner violence and HIV risk behavior among men in the Eastern Cape region of South Africa, Dunkle and his colleagues (2006) report that 31.8% of the 1275 men interviewed reported engaging in physical and/ or sexual violence against their female partners. Dunkle and colleagues also found that men who reported at least two or more episodes of perpetrating physical and/or sexual violence against their partners registered significantly higher levels of HIV risk behavior than men who reported less frequent perpetration of violence. In another study on gender-based violence, relationship power, and risk of HIV infection among South African women, Dunkle and colleagues (2004) found that intimate partner violence and control in a woman's current relationship were associated with HIV infection risk – even after adjustment for age, current relationship status, and women's

individual risky behavior. These findings suggest that HIV prevention interventions must clearly address the links between the perpetration of sexual partner violence and HIV risk behavior among men.

Religion is yet to be given much attention in the literature on HIV and AIDS. However, reviews of the literature on religion and health in general reveal important positive and negative effects of religious involvement on physical health and mortality (Koenig, et al., 2001). There is no doubt that religion has played a role in how the HIV/AIDS epidemic is fought and viewed within particular social contexts since very early in the pandemic. The relationship between religion and HIV prevention, however, has often been an ambiguous one – split between religious morality and ethics in support of people living with HIV/AIDS, and insisting on certain moral codes requiring that society and social agents stay in line with the respective religious beliefs. But some of the recent studies coming out of sub-Saharan Africa have tried to bridge this gap by exposing significant variation in HIV infection-related attitudes and behavior by religious affiliation. For example, an examination of Muslim-Christian differences using national-level measures of HIV prevalence for 38 countries in sub-Saharan Africa found that a country's percentage of Muslims was associated with lower HIV prevalence (Gray, 2004).

Contextual/Neighborhood Characteristics:

Whereas individual-level variables characterize individuals, contextual or neighborhood variables are indicators of neighborhood-level characteristics. In this study, neighborhood variables include: average age, average level of education, average socioeconomic status, proportion married or partnered, proportion domestic violence tolerance, proportion catholic, proportion protestant, proportion other religion, and place of residence (rural/urban).

In HIV/AIDS research, neighborhood-level variables have been successfully used to examine neighborhood influences on individual behavior that could potentially expose individuals to HIV infection risk. For example, using neighborhood-level measures obtained by aggregating individual-level indicators, Kayeyi (2006) and his colleagues examined the effects of neighborhood-level educational attainment on HIV prevalence among young women in Zambia. The measure for neighborhood-level educational attainment was constructed by aggregating individual-level years in school variable.

A number of studies have suggested that neighborhood characteristics play an important part in the spread of HIV. For example, Kayeyi, Sandøy, and Fylkesnes (2006) examined the effects of neighborhood-level educational attainment on HIV prevalence among young women in Zambia and found neighborhood educational attainment to be a strong determinant of HIV infection in both urban and rural populations – that is, HIV prevalence decreased with increasing levels of neighborhood education.

Place of residence accounts for the fact that the risk of HIV infection depends on HIV prevalence in an individual's social networks - including sexual networks, which tend to be location specific. Concurrently, place of residence might determine access to prevention messages and methods such as condom use (De Walque, 2002). Several studies have showed significant differences in HIV infection risk between urban and rural populations, both in Africa and in other populations affected by the HIV epidemic. For example, Arroyo et al. (2005) examined HIV prevalence rates in the Mbeya region of Tanzania and found infection rates for both men and women to be higher in urban areas than in rural areas. Analysis of the 2000 HIV surveillance data for Kenya, commissioned by the Kenyan Ministry of Health (KMoH), also found HIV prevalence rates in urban areas to be 17 -18%, compared to 12-13% in rural areas (KMoH, 2001). Place of residence is an important variable in HIV prevention research, especially in Developing countries like Uganda, where high rates of urbanization are causing constant rural to urban movements of people seeking for jobs, and urban to rural movements of people displaced by the urbanizing project. This constant movement of people (temporary internal migrations) is likely to affect the dynamics of HIV transmission in both rural and urban areas.

Theoretical Foundation

This study draws on Anthony Giddens' theory of 'structuration', which has been elaborated in numerous research publications over the years (Giddens, 1979, 1984; Cloke

et al., 1991). While rational choice theories concentrate on the individual as the unit of analysis, structuration theory provides an *agency-structure* analytical framework, which integrates both individual and contextual characteristics in a single paradigm (Webb, 1997:40 - 41). In the study of HIV/AIDS prevention, this framework allows for the analysis of HIV-risk behaviors of individuals within their different contextual settings (Webb, 1997), thus affording prevention and health promotion researchers a framework to conduct comprehensive investigations that can identify the essential factors in the distribution of HIV infection in specific populations and contexts. I call this approach the *'actor-in-context'* paradigm.

Highlighting the relative importance of agency and structure in determining health behavior is essential for identifying successful intervention and health promotion measures. As Cockerham (2005) notes, no contemporary theoretical perspective denies the importance of either *agency or structure* in determining health behavior. Rather, Cockerham argues, "the debate centers on the extent to which one or the other is dominant" (2005:51). In particular, there is disagreement over the extent to which individuals are capable of exhibiting agency by acting free of the constraints imposed on them by the social contexts (social systems) in which they live. Proponents of structure underscore the capacity of contextual conditions to influence individual choices and behavior along socially prescribed ranks, while advocates of agency emphasize the ability of individuals to choose their behavior in spite of contextual influences. Symbolic interactionists, such as George Simmel and Herbert Blumer, for example, underscored the

centrality of human agency, and referred to social systems as merely the result of agency (Blumer, 1969). Simmel (1952) ([1902] 1950) wrote that "society is merely the name for a number of individuals connected by interaction" (1950:10). Other sociologists have argued that social life is organized around networks of statuses and roles, which are external to individuals and greatly constrain and determine what people think and do (Kuhn, 1964; Johnson, 2000; Cockerham, 2005).

Despite the extreme positions, there is good reason to argue for a middle ground while dealing with human agency and structure. As Anthony Giddens (1979) notes, it is a mistake to talk about human agency and structure as separate from each other, because neither exists, except in relation to the other (Giddens, 1979, 1984). Agency and structure have been variously defined and interpreted over the years, but *agency* is redefined here as the capacity of the actors (individuals) to choose behavior, and *structure* refers to regularities in social interaction, relationships, and resources that script behavior to go in particular directions as opposed to others that might be taken (Cockerham, 2005). When applying an *agency-structure* framework to HIV infection in heterosexual contexts, the question is whether the decisions people make with respect to HIV-risky behavior, such as failure to use a condom and having multiple sexual partners, are mainly the result of individual choice, or are fundamentally shaped by social conditions such as gender power relations and socioeconomic status position, among others.

There is a need for a more creative understanding of social change in the field of disease prevention, which stresses the interplay and mutual determination of individual

and contextual factors. For parsimony reasons and lack of adequate data, however, the analysis in this study mainly focuses on how contextual factors influence individual choice and behavior relating to HIV infection risk. The analysis in this study is premised on the understanding that, while it is important to recognize the role of individual human action and consciousness, it is equally important to pinpoint the influence of contextual forces that affect individual lives. Over the years there have been a number of studies taking an actor oriented approach. However, as Long (2001) argues, “many of the them fall short due to the tendency to adapt a voluntalistic view of decision-making to stress the transactional nature of actor strategies, which gives insufficient attention to examining how individual choices are shaped by large frames of meaning, and action … and by the distribution of power and resources in the wider arena” (13).

The centrality of social context in influencing health behavior, including HIV-risk behavior, has been recognized in many parts of the world. For example, in a study of social conditions in a working-class neighborhood in England, Williams (2003) underscores the disabling influence of social context on health-related social behavior when he writes, "the respondents understood the behavioral risk factors that made ill-health more likely and for which they were, in a limited sense, responsible, but they were also aware that the risks they faced were part of social conditions that they could do little to change" (2003:147).

In a study of HIV-risk behavior among young people (aged 14 - 24) in KwaZulu-Natal province, South Africa, Kelly Hallman (2004) found relative social disadvantage to

significantly increase the likelihood of a variety of unsafe sexual behaviors and experiences. Hallman concludes that "without sufficient attention in the design and placement of HIV prevention programs in the economic and social conditions in which individuals live, the potential effectiveness of the global response to HIV/AIDS is sacrificed" (2004:1).

A number of public health historians have argued that the decline of infectious disease in Europe and North America in the 19th century predates scientific medicine, and may more correctly be attributed to improvements in basic needs of human life, such as better sanitation, clean water, better nutrition, and less crowded living conditions (Dubos, 1959; Szreter, 2005). In the book *'Health and Wealth'* (2005), for example, Szreter agues that the almost complete eradication by the end of the 19th century of typhoid, cholera, and smallpox in Britain testifies to the importance and effectiveness of various aspects of the large-scale strategic public health measures that were introduced: provision of sufficiently clean local water supply, a properly functioning national system of surveillance to identify and contain local outbreaks, and the establishment of regular and efficient communication infrastructure for effective outbreak reporting, both locally and internationally (125). Szreter goes on to suggest, however, that all these public health improvements would probably not have been possible without the element of "human agency in form of gradually negotiated expansions of preventive public health provisions and services at the local level…" (102).

What Szreter highlights here is the importance of the reciprocal association that exists between agency and structure or actors and the social institutions, norms and customs that shape individual lives. A viable strategy to stem HIV/AIDS, then, ought to simultaneously focus on individual actors and the social context within which they live, because the two are inextricable. Elaborating on this double effect, particularly the power dynamics between agency and structure, Anthony Giddens (1987) writes:

> "In following the routines of my day-to-day life, I help reproduce social institutions that I played no part in bringing into being. They are more than merely the environment of my action since …they enter constitutively into what it is I do as agent. Similarly, my actions constitute and reconstitute the institutional conditions of actions of others, just as their actions do mine… My activities are thus embedded within, and are constitutive elements of, structured properties of institutions stretching well beyond myself in time and space" (11).

The Sociology of AIDS

In an effort to contribute to HIV prevention research, the last three decades of the 20th century saw the establishment and development of a cohesive body of scholarly works that addressed the HIV/AIDS epidemic and came to be known as the *'Sociology of AIDS'.* From its origins during the pandemic of the early 1980s, the sociology of AIDS offers fine examples of the contributions sociologists can make to disease-related social and behavioral research. These include the identification of the social groups at risk of the disease, the identification of behaviors or social conditions that augment the risk, and the study of issues pertaining to collective and individual change (Moatti et al., 2000; Lemalle et al., 2000). As the body of work has grown in volume, the studies have also diversified, with some sociologists working on applied social research projects, such as

the formulation of HIV preventive strategies, while others have focused on the personal experience of people living with HIV/AIDS, the provision of HIV/AIDS care, and the implementation of social network analysis in building models of HIV transmission. Furthermore, HIV/AIDS research has encouraged the production of quantitative work on sexual attitudes, lifestyles, and behaviors, providing ample opportunity for social scientists to study the personal and cultural effects AIDS has had on sexuality and sexual behaviors.

In spite of this variety of sociological studies, the field of HIV/AIDS-related sociological research remains limited by its roots in 19th century sexuality research, which insisted almost exclusively on individuals' lifestyle-changes as the only way to combat sexually transmitted infections (Heffernan, C., 2002; Farmer et al., 1993; Farmer et al., 1996). HIV/AIDS prevention policy in Uganda and most of the Developing World has been primarily informed by two major theoretical perspectives: *(1) Cultural theory,* and *(2) Rational Choice.*

Cultural Perspective

Among the prominent framers of this perspective are anthropologists who conducted some of the pioneering research on the HIV/AIDS epidemic in Africa. Caldwell and Quiggins, for example, argued that the pattern of HIV transmission between African and Western societies differs because of the level of sexual activity and lack of sexual orientation among Africans (Caldwell and Quiggins, 1989). They ascribed the

rapid spread of HIV to sexual permissiveness within the African society. They claimed to have discovered a pattern of sexual permissiveness rooted in the absence of moral and institutional constraints especially with regard to women in urban areas. Africans were said to hold more permissive attitudes towards sexual relationships with multiple partners and towards extramarital sex.

To explain the skewed male to female HIV case ratio found in sub-Saharan Africa, they argued that, “A pragmatic attitude exists in Africa toward [female sexuality], with a fair degree of permissiveness toward premarital relations that are not too blatantly public, and a degree of acceptance that surreptitious extramarital relations are not the high point of sin and usually should not be severely punished" (Caldwell et *al.* 1989: 189). They further argued that "African society recognizes, as a distinct phenomenon, longer term girlfriends, mistresses [and] outside wives..., who partly serve in urban areas as alternatives to polygynous married wives” (Caldwell et al, 1989: 189).

Odebiyi and Vivekananda (1991) attributed the circumstances to such cultural factors as polygamy which, they argued, drives neglected wives to seek sexual fulfillment outside marriage, and the high value placed on children in African culture, which promotes indiscriminate sexual activities**.** HIV/AIDS policy for Uganda, therefore, has continued to rely heavily on condom provision and secondarily on treatment of sexually transmitted diseases (STDs), reinforcing the commonly accepted notion that the high prevalence of HIV in Africa is primarily due to very high rates of sexual permissiveness that are unpreventable. The notion that African sexuality is a special case, although not

supported with data, has been widely accepted in much of the literature on HIV transmission. Empirical work, however, demonstrates the impossibility of attributing differentials in HIV transmission solely to differences in sexual behavior. Such a conclusion ignores a wealth of epidemiological, clinical, and laboratory evidence that demonstrates the influence of a host of factors in the transmission of infectious diseases, including HIV. HIV infection and AIDS, like other infectious diseases, is the result of all the complex and interrelated factors that exist in poor countries. Leaving prevention essentially to condom provision (and treatment of STDs) reinforces the notion that HIV transmission is narrowly the result of high levels of sexual activity and fails to address other HIV determinants, such as education, the impact of poverty, and the status of women.

Rational Choice Perspective:

Building the foundation of rational choice theory, James Coleman argued that

> "… since social scientists take as their purpose the understanding of social organization that is derivative from actions of individuals, and since understanding an individual's action ordinarily means seeing the reasons behind the action, then the theoretical aim of social science must be to conceive of that action in a way that makes it rational from the point of view of the actor" (Coleman 1990: 17).

Apparent in Coleman's statement is the postulate that individuals act rationally and purposefully. Despite rational choice's ability to be expanded to include contextual considerations – what Michael Hechter and Satpshi Kanazawa (1997) call "thick" models

of rational choice theory, the majority of the pioneering scholars on HIV/AIDS in Africa have taken a much more narrow view concentrating on the individual as the unit of analysis – what Michael Hechter and Satoshi Kanazawa (1997) call “thin” models of rational choice. Rational choice is a simplified set of assumptions about human behavior in which social action is a sum total of individuals acting to maximize their interests through the calculation of costs and benefits. Behavior thus reflects a rational calculus of benefits and losses. This is the key to understanding human phenomena including sex, according to Philipson and Posner. Despite their recognition of the role of poverty as a background characteristic, Philipson and Posner fail to pay attention to the set of the variables that social context provides in the HIV/AIDS causal chain.

In their book, *“Rational Choices and Public Health: The AIDS Epidemic in an Economic Perspective,” (1995)* Philipson and Posner contend that the rational choice model offers a useful framework to explain the spread of HIV/AIDS, and focus on three factors as central to explaining the African epidemic: The nature and size of "high risk groups" in the population – that is, the high prevalence of prostitution and non-monogamous sexual relationships; the high prevalence of sexually transmitted infections (STDs); and the real costs of condoms in the African context. Among other things, Philipson and Posner argue that since infections are rampant among African prostitutes and females in non-monogamous relations, there is very little incentive towards safe sex. “The likelier one is to be infected already, the smaller the expected benefits of safe sex"

(Philipson and Posner, 1995: 842). Consequently many of the females do not bother about safe sex.

Although these studies are a useful contribution to the field of HIV/AIDS prevention research, the rational choice perspective on which they are built is significantly limited as a tool for understanding social change and the role of social factors in disease prevention, precisely because of the focus on the individual as the unit of change and prevention, without simultaneously considering the context in which individual lives are lived.

Dominant Theories in HIV/AIDS Prevention, Deriving from Rational Choice

Leading a series of rational choice, individually focused theories of disease prevention (including HIV/AIDS) is the traditional Health Belief Model (HBM), which emphasizes the necessity and centrality of rational action in disease prevention. Based on the work of Irwin Rosenstock (1966) and Marshall Becker (1974), the HBM is a social psychological model designed to explain the motivation and activity of healthy individuals to avoid the threat of illness (Rosenstock, 1966; Cockerham and Ritchey, 1997). The model proposes an approach that looks at human behavior as being dependent on two primary variables: (1) The value a person places on a particular outcome, (2) the person's belief that a given action will result in that outcome. Thus, the model suggests that, "preventive action taken by an individual to avoid a disease is due to that particular individual's perception that he or she is personally susceptible and that the occurrence of

the disease would have at least some severe personal implications" (Cockerham and Ritchey, 1997: 52).

In the case of HIV/AIDS, the Health Belief Model would suggest that as long as people know that they are at risk of contracting HIV/AIDS, which is a threat to their life, and are aware of the measures they need to take to prevent HIV/AIDS, such as condom use, they would logically use those measures. However, despite its mention of so-called "action cues," the HBM fails to effectively account for external factors, such as social context, which may stand in the way of rational deliberations and eventual choice. Cockerham (1997) notes that, ". . . while an individual may perceive that a given action [e.g., condom use] will be effective in reducing the threat of disease [HIV/AIDS infection], that action may not be taken if it is farther defined to be more expensive, too unpleasant or too painful, too inconvenient . . ." (1997:52). However, the theory is still limited because of its focus on the individual.

The second is *decision theory* (also called *subjective expected utility* – SEU), which suggests that people weigh options and consequences, and assess the desirability and likelihood of success to decide their course of action (Beyth-Maron 1993). But this theory ignores social influences and does not account for action that is neither well thought out nor deliberate (Furby 1992).

The third is the *theory of reasoned action*, which improves on decision theory. It assumes precisely the tenets of decision theory by including subjective norms as a factor in decision-making (Fishbein, and Ajzen 1975). Here, subjective norms are defined as

normative beliefs regarding behavior or the extent to which referent-others are perceived as approving or disapproving. But even with subjective norms in mind, only the intent to perform a specific behavior is predicted in the theory of reasoned action, not an actual behavior itself (Kuther 2002). According to Abraham (1998), the theory of reasoned action has been found to be statistically predictive, but it is not predictive of the behavior of actual individuals. What Abraham highlights here is the weakness of applying a logical model to individual behavior without accounting for contextual and socio-cultural influences, such as neighborhood socioeconomic status and domestic gender power dynamics. The fourth is *social learning theory (*Albert Bandura, 1977). Social learning theory comes closest to providing a framework for explaining and predicting behavior based upon an integration of internal psychological processes, cognition, modeling of observed behavior, and environmental stimulants. On this merit, people's behaviors are neither based upon internal psychological processes nor are they just outcomes of social forces beyond their control. From situation to situation, behaviors are more individualized or more social, and a large part of the extent to which it is one or the other is self-regulated based upon prior experience, one's goals, and the range of behaviors one has to respond to the situation.

While HIV and other sexually transmitted infections are affected by patterns of sexual behavior in a population and certain health-related practices heighten the possibility of infection, HIV and other sexually transmitted infections are not exclusively determined by individuals' unmediated choices. Although it is important to hold

individuals accountable in the case of sexually transmitted infections, it is equally vital to consider such infections as outcomes of a combination of factors, which are biologically, behaviorally, and socially linked.

There is growing awareness that even with knowledge of how to avoid HIV infection, such knowledge may not be useable in the face of the social and economic disadvantages that characterize the daily experiences of individuals, households, and communities (Farmer et al., 1993; Farmer et al., Bloor, 1995; 1996; Campbell et al., 2003; UNAIDS, 2004; Hallman, 2004). The spread of HIV depends on people being at high risk of infection, and infection rates are highest among people in vulnerable or high risk situations. High risk situations are defined here as socially and geographically defined places, where the ability of the individual to respond to a health threat is considerably reduced. In Uganda, like most of the developing world, conditions that create high risk situations are apparent. These include high levels of poverty, community instabilities (civil conflict), gender power disparities, etc. As Webb (1997) notes, the combined effect of these macro-processes is that the threat of HIV infection is not prioritized in the daily experience of individuals, because concerns of daily survival become dominant. For example, think of the thousands of unemployed young men and women in Uganda who roam the streets of Kampala in search of the most basic means of survival, such as food, shelter, and clothing. Uganda's unemployment rate is estimated at 23%, with young people suffering the greatest share of this burden (Baguma, 2005). The threat of an HIV infection to these young people is likely to come at the bottom of the

priority list. It is, therefore, important to note that theories and studies that take into consideration the context of the people affected stand to significantly benefit the fight against HIV/AIDS.

CHAPTER THREE: DEMOGRAPHIC PROFILE OF UGANDA: Pathways of Health and Disease Distribution

To understand the factors underlying HIV/AIDS infection in Uganda, it is important to locate them in the framework that recognizes not only the behavioral, but also the cultural, political, and socioeconomic context of the population. In this chapter, I also present a historical overview of Uganda, which sets the context into which the country finds itself today.

Historical Overview: Setting the Context for Health and Disease in Uganda

Uganda is a small landlocked country located in East Africa, with an area of 93,070 square miles (about the size of the United Kingdom, or the state of Michigan in the United States), and an estimated population of 33 million people, according to the recent Uganda population and housing census report (Uganda Bureau of Statistics, 2006). It is also one of the world's poorest countries, ranked 146th in the 2007 Human Development report of the United Nations, out of 177 countries in the world.

The country is relatively young, created as a colonial territory in 1894. Unlike many countries from around the world (created by a gradual process of national integration), Uganda's borders were drawn randomly, and entirely determined by the imperial powers of Great Britain, France, and Germany competing in the 19th century for control of territory in the region, and control of the headwaters of the River Nile (Buganda Agreement, 1955; Leggett, 2001; Reid and Currey, 2002). These arbitrary borders split previously allied and relatively homogeneous populations, throwing

longstanding cultural, social, political, and economic relationships into upheaval. The Uganda created in 1894 was at first viewed by many Ugandans as an imperial fiction to which they had no obligation to pay allegiance. But after achieving independence from Britain in 1962, Ugandans rejoiced and started expressing growing enthusiasm about the future of their country, both on street corners, and in the privacy of their homes. At independence, a significant investment was made in health care, education, and the establishment of an effective public services system (Leggett, 2001). Uganda was a real emerging success story with rapid agricultural growth, a developing industrial sector, and growing intellectual and cultural leadership. Everything seemed to run smoothly, and the air of optimism was evident, both inside Uganda and abroad, casting Uganda as the miracle of post-colonial Africa. Indeed, the potential of the beauty that Winston Churchill had seen much earlier in 1907, when he described Uganda as the *'Pearl of Africa*,' was becoming apparent to many.

However, progress was dramatically reversed by the mid 1960s when political instability was followed by a coup led by General Idi Amin in January 1971. Only four years after achieving political independence, political rivalry between competing political groups mired the country into a sinister period of unprecedented political turmoil. Horrendous crimes were committed, tearing the fabric of the burgeoning nation to the core, and eroding the confidence of the citizens. Uganda suffered despicable state repression and political violence throughout the 1970s. Even after the fall of General Idi

Amin in 1979; a series of vicious civil conflicts continued into the 1980s (Hansen and Twaddle, 1988; Leggett, 2001).

Between the mid-1960s and the mid-1980s, Uganda's economy was completely shattered by corruption and inefficiency. By the early to mid-1980s, when the HIV/AIDS pandemic took a toll on the country, Uganda had become one of the poorest countries in the world. The education and health systems had collapsed, the physical infrastructure had crumbled, and the civil service system had been destroyed by low wages and poor morale. In 1985 real gross domestic product (GDP) per capita was 42 percent below its 1970 level, the public revenue base had collapsed, and inflation was astronomically high. Government expenditure on basic social services, exports, and investment had also fallen to below 10 percent of GDP (Hansen and Twaddle, 1988).

Despite the relative peace and economic development that Uganda has experienced in the past two decades, the government is still fighting a brutal and costly over 23-year old insurgency in much of the northern region, mostly in the districts of Gulu and Kitgum, on the Sudanese border. The insurgency has severely devastated the region, leaving thousands of children maimed and orphaned. Many children have been abducted by the rebels – the Lord's Resistance Army (LRA) – who force them to work as sex slaves and fighters (child soldiers). According to the 2004 report of the World Health Organization (WHO, 2004),

> . . . the insurgency in northern Uganda is affecting around 2.3 million people. In the past two decades, violence has intensified, with disastrous effects on people's health, and society at large. The humanitarian situation is characterized by insecurity, large-scale displacement and limited assistance: difficult food relief, no access to water, sanitation, or health care. The result is extreme food insecurity—the 11 Therapeutic Feeding Centers

> (TFCs) in Northern Uganda have doubled their admissions in the last 12 months—and spiraling mortality in some IDP camps. At the end of September 2004, there were 1.6 million internally displaced persons (IDPs). To these, one must add 220,000 refugees, 187,000 of them from Sudan. UNICEF estimates that 80% of IDPs are women and children. The 'war of children against children' as it has been called, continues: the Lord's Resistance Army (LRA) has abducted over 12,000 children since June 2002, and another 44,000 children commute between the countryside and towns at night to escape rape, abduction, or death (2004:1; See also, ICG, 2010).

This environment of extreme poverty and lack of fulfillment of basic needs has made northern Uganda more prone to disease and epidemics than any other region of the country. Ebola has hit the region more than twice in a span of less than 6 years, and HIV prevalence rates and AIDS deaths in the region are among the highest in the nation. For example, a recent survey in Lacor Hospital's HIV sentinel surveillance site indicated a prevalence rate of 11.3% among pregnant women. Lacor is the only major hospital in northern Uganda, serving the insurgency-ravaged districts of Gulu and Kitgum (WHO, 2004; 2008).

Uganda's Emerging Economy

Uganda has a small and predominantly agricultural economy. But in recent years, the country has been applauded by many in the international community as Africa's emerging economic 'success story.' While the political upheavals of the 1970s profoundly paralyzed all sectors of Uganda's economy and eroded citizens' confidence, the late-1980s brought new hope, when a new government in Kampala undertook aggressive steps to rebuild the economy and restore citizen confidence. The government embarked on an economic recovery program aimed at reducing poverty by restoring

fiscal discipline and monetary stability, as well as rebuilding basic social and economic infrastructure. Since 1987, the government has worked consistently to implement and improve an economic reform program that has now attracted the attention of the entire region.

In the early 1990s, Uganda started a reform agenda of decentralizing political power to local government. The new constitution adopted in 1995 succeeded in transferring responsibilities and power to local governments, at the district level. Elected district officials were given direct responsibility to develop and secure their local areas. The Local Government Act of 1997 deepened reforms by extending authority to local councils at the sub-county level to raise revenues and initiate development projects. This arrangement has helped, to a certain extent, increasing levels of accountability, as well as encouraging rural development.

Uganda's economic reforms are credited for giving the country an average GDP per capita growth rate of 3.6 percent since 1995; increasing youth literacy from 75 percent in 1995 to 86 percent in 2003; increasing access to safe water from 54 percent in 2000 to 65 percent in 2003 in urban areas and from 50 percent to 55 percent in rural areas; as well as reducing the national HIV/AIDS prevalence rate from about 18 percent in the 1990s to about 6 percent in 2003 (World Bank, 2005). The same approach of decentralizing powers and responsibilities for social and economic development was applied to HIV/AIDS prevention – under the 'multi-sectoral approach.' The multi-sectoral approach to HIV went beyond the health sector, setting up AIDS control

programs that involved other sectors of the economy, including civil society. This arrangement allowed the full cooperation and participation of all social institutions - non-governmental organizations, the church, other citizens' groups, and government in planning a strong response to the HIV/AIDS epidemic. Indeed, the guiding document of Uganda's multi-sectoral strategy emphatically states that in the fight against the HIV/AIDS epidemic,

> All Ugandans have individual and collective responsibility to be actively involved in AIDS control activities in a coordinated way at the various administrative and political levels down to the grassroots level. The fight against AIDS is not only directed at the prevention of the spread of HIV but also addresses the active response and management of all perceived consequences of the epidemic" (Uganda Aids Commission, 2003:.2).

Uganda also launched a strong Information, Education and Communication (IEC) strategy to ensure public education for awareness, knowledge and behavior change. Activities have included mass campaigns on all the nation's FM radio stations, the popular press, and community mobilization campaigns, including drama, person-to-person communication and health education sessions in schools and villages. Central to the campaign message is encouraging people to seek knowledge of their HIV/AIDS status by taking advantage of the Voluntary Counseling and Testing (VCT) services instituted by the government, and are available in 40 out of the 56 districts in Uganda.

International praise for Uganda's economic reform efforts (and HIV/AIDS prevention) has been pouring in from around the world, with the most high profile comment coming from Sugisaki, the then Deputy Managing Director for the Executive Board of the International Monetary Fund (IMF):

> "The Ugandan authorities are to be commended for the continued implementation of sound macroeconomic policies and structural reforms, which have helped to sustain high economic growth rates with low inflation. This strong economic performance, combined with determined implementation of a comprehensive poverty reduction strategy, contributed to a substantial decline in the incidence of poverty in Uganda over the past decade (IMF, 2005)."

A key component of Uganda's economic reform program has been an unrelenting poverty eradication campaign, spearheaded by the President Yoweri Museveni. The country started addressing poverty as a serious development challenge in the early 1990s. Responding to the high social costs of structural adjustment, the government launched an aggressive poverty reduction campaign, culminating in the creation of the Program for the Alleviation of Poverty and the Social Cost of Adjustment (PAPSCA), now considered to be one of the most developed poverty reduction programs in sub-Saharan Africa (World Bank, 2004). Despite the lack of adequate financial resources to effectively facilitate the poverty reduction program, government worked hard to implement the program, beginning with transferring greater authority to local levels to fortify the campaign against poverty. The program was designed to provide targeted social services and welfare to specific needy groups, such as orphans, slum dwellers, war widows and civil servants that were laid-off during the structural adjustment 'project.'

In 1995, a new program – the Poverty Eradication Action Plan (PEAP) - was created, intended for a much wider range of beneficiaries than the narrowly targeted Program for the Alleviation of Poverty and the Social Cost of Adjustment (PAPSCA). The Poverty Eradication Action Plan (PEAP) was designed to be more comprehensive and systematic, aimed at addressing the entrenched historical and structural roots of

poverty. In its poverty eradication program, the Uganda government identifies a three-pronged approach to the program: (1) increasing incomes of poor households by fortifying the economic infrastructure, such as roads, land, agriculture, and rural markets to increase employment and labor productivity; (2) improving the quality of life for the poor by guaranteeing basic social services, such as primary health care, education, a safe environment, and disaster management; (3) reestablishing peaceful conditions throughout the country and strengthening governance by providing security and reforming state and government organs to reinforce transparency and accountability (Uganda government, 1999). In all this, the goal of the Uganda government is to eliminate, or reduce the incidence of excessive poverty to 10 percent by 2017(Government of Uganda, 2005; World Bank, 2004).

Continual Poverty

Despite Uganda's ten-year anti-poverty campaign, the reality of poverty on the ground in Uganda is far from the optimistic picture sometimes portrayed in international headlines. Even some of Uganda's recent gains in basic needs provision have started to rapidly decline. For example, a preliminary household survey indicates a rise in the incidence of poverty from 34 percent in 1999/2000 to 38 percent in 2002/2003, due to increasing inequality, yet it had previously declined from 56 percent in 1992 (AfDB/OECD, 2004).

Uganda's economy has a historical disadvantage that continues to undermine its efforts to ensure sustainable growth and development. At its founding, Uganda was integrated into a colonial trading system that was designed to serve the interests of Britain – the former colonial master. Throughout the colonial period and even through the formative years of Uganda as a nation, the country's role was to provide certain agricultural commodities (primarily coffee and cotton), grown by thousands of small-holders who provided for their own subsistence by growing their own food crops. Plantation agriculture was not an economic investment that the British were ready to undertake in Uganda. By 1962, when Uganda gained political independence from Britain, it had virtually no viable export base (Leggett, 2001).

Four decades after independence, Uganda's basic socioeconomic structure remains essentially the same. Although Uganda is no longer constrained by an imperial trading system, and has been incorporated into the global market, the role of the Ugandan producer remains about the same as it has been for generations. Coffee continues to be the country's major export, a single-crop dependency that leaves the national economy vulnerable to price fluctuations in the international market. Every time the price drops, Uganda's export earnings also fall, often offsetting gains achieved through painfully negotiated debt relief. Agriculture accounts for 50 percent of GDP and 80 percent of employment in Uganda. Food, most of which is produced through subsistence agriculture rather than agribusiness, accounts for two-thirds of agricultural production.

I returned to Uganda in January of 2005 for three weeks in order to assess current social developments. As part of that inquiry, I went to five villages in the central districts of Mpigi and Mubende and made door-to-door visits. Central Uganda has been among the leading beneficiaries of the social and economic development investments of both government and NGOs for about the past two decades. And yet little has changed in terms of improved social conditions, and means of survival. Many people still rely on their own labor or that of family members to survive, and cannot pay for medication, or transport to hospitals and/or health centers for healthcare. They use their hands to grow their food, walk long distances to find water to drink, and firewood is still the only accessible source of energy for Uganda's largest, and most important economy – the rural agricultural sector.

Health and Health Infrastructure

Like the rest of Uganda's essential institutions, the health care system was almost entirely destroyed by both the country's recurrent civil wars that started in the early 1970s and the subsequent economic decline. But in the early 1990s, the government embarked on a campaign to rebuild health services institutions with an underlying theme of increasing access to health care (MoH, 2000). The restoration of health services and greater collaboration with non-government organizations (NGOs), community-based organizations (CBOs), and the private sector has improved health service delivery (UNDP, 2000; HRW, 2003). The government has finalized a 10-Year Health Policy,

developed a 5-Year Health Sector Strategic Plan, and formulated a National Minimum Health Package to provide cost-effective treatment for ubiquitous health conditions such as malaria and tuberculosis (MoH, 2001). In 2001, the government reported 1,156 government health units around the country - hospitals, health centers, dispensaries, and maternity units (MoH, 2001).

A central goal in Uganda's health sector reform undertaking is to instill discipline and accountability in public health officials at all levels. The implementation of health care programs goes with a deeply involved monitoring system of planning and documentation to allow accurate evaluation and accountability. Below is a sample table to the summary of 'achievements against targets' produced by the national HIV/AIDS prevention unit(s).

Table 1: Summary of Achievements Against Targets for HIV Prevention, 2000/2001

Performance Indicators Year 1 Targets	Achievements	Remarks/Comments
1.1 Print guidelines for care of people living with AIDS (PLWA)	1.1 Ten thousand copies of the guidelines printed and distributed to all districts	1.1 Guidelines for use by operational level health workers
1.2 Develop Policy on reduction of MTCT	1.2 Policy finalized	1.2 Awaiting printing. Critical document for implementation of the PMTCT strategy in the country.
1.3 Develop Policy and Guidelines for feeding infants of HIV positive mothers	1.3 Finalized	1.3 Awaiting printing
1.4 Expand access to ARV drugs in the country	1.4 An 80 –90% cost reduction successfully negotiated. An expert committee was appointed to develop a plan and oversee further expansion. TA was also procured from UNAIDS.	1.4 Four new accredited treatment centres will start by Dec. 2001. There is an expansion plan to all regional hospitals and later to the rest of the country
2.1 Conduct the following training activities at the district level:	2.1 The following were trained o Trained DEO, DIO, and	2.1 As below, respectively: o –

o Strengthen HIV prevention and control strategies for schools o TOT for infection control in 12 districts o OJT for infection control in – districts o TOT in clinical management, counseling and home care. o Specialized training (including lab staff) for VCT and PMTCT in 12 districts o Training in sentinel methodologies	centre coordinators in 38 districts. o TOT for infection control accomplished in 5 districts o OJT done in 5 districts o TOT in clinical management done for --- o Specialized training for VCT and PMTCT done in all 12 districts o Specialized training done for all 20 sentinel sites	o - o o Important for care and support activities in the districts o Planning expansion of VCT to 8 more districts and to PMTCT to all districts o This level of training vital for generating data on trends of HIV infection.
2.2 Mass Mobilization through various media channels, film vans,	2.2 HIV/AIDS prevention and control messages aired on 14 FM radio stations, mobilization through film vans was conducted in 10 districts.	2.2 Plan to expand to more up coming upcountry FM stations. Film vans have massive crowds in districts. 6 more vans expected under MAP.
2.3 Production and dissemination of IEC materials	2.3 Produced 70,000 copies of 4 types of IEC materials and disseminated them to districts.	2.3 –
2.4 Social mobilization for condom promotion and use	2.4 Social mobilization for condom promotion and use was carried through social marketing groups under MOH	2.4 Coverage of social marketing to rural areas is still a challenge
2.5 Procure and distribute drugs and other supplies	2.5 Distributed 60 million condoms through NMS and the private sector (social marketing etc.). Initiated procurement of 100 million condoms; arriving FY 01/02.	2.1 Twenty million condoms procured under GOU funds (arriving soon) and 80 million under MAP (arriving late in 01/02).
2.6 Procure HIV testing reagents & kits	2.6 Procured testing kits & reagents worth $320,000	2.2 Paid for by GOU funding (delayed delivery – will arrive FY 01/02).
2.7 Procure and distribute STI drugs	2.7 STI / opportunistic infections drugs not procured.	2.3 Available funds reallocated to purchase ED kits (600M/-)
3.1 Provision of quarterly Technical support to districts	3.1 Provided technical supervision twice to each district covering IEC, patient care/support, STD, Infection control, and surveillance.	3.1 Due to shortage of funds visits could not be done quarterly
4.1 Study on management of medical wastes in private clinics in Kampala.	4.1 Study done in all 5 divisions of Kampala and final report available.	4.1 Study noted that medical waste management is a big challenge in Kampala. 4.2 Noted awareness is almost

4.2 Under take KABP studies	4.2 KABP studies done in 4 districts (Lira, Pallisa, Kiboga and Masindi) and among commercial sex workers in Kampala.	universal; deeper knowledge is at about 80% in rural areas, 90% in urban areas; age at first sex increased from about 14 years in 1989 to 16 years in 2000; increase in condom use e.g., short term/casual relationships from 40% (1997) to 55% in 2000, and in Kampala from 57% to 76%.
		4.3 Prevalence rates declined from 6.8% in 1999 to 6.1% in 2000 among ANC clients.
4.3 HIV sentinel surveillance among ANC and STD clients	4.3 HIV Sentinel surveillance surveys done in 20 sites among ANC and STD clients.	
5.1 Service delivery levels	A comprehensive program for HED/ Information dissemination is on going in all districts. A program for care and support across a continuum of care including clinical management, counseling and home care is on going at all levels. These are being strengthened through partnership with NGOs and Communities and PLWA. PMTCT and VCT being implemented in 31 districts in collaboration with NGOs. As a result of these measures, HIV prevalence and incidence rates declined by 50% in the last 10 years and continued to decline in the last one year.	

Source: Uganda Ministry of Health and USAID, Annual Health Sector Performance Report, 2000/2001

Despite Uganda's noticeable progress in building a feasible health infrastructure base, and improving health services delivery and access, much of the country's health conditions are substandard. Scarce medical supplies and untrained personnel still characterize many of the health units Uganda has built and reconstructed. In 2000, for example, a United Nations survey found unsettling decline in access to health care dating back to the early 1970s, with about 69 percent of rural health units run by untrained personnel (UNDP, 2000). According to the United Nations report, rural health facilities are generally inaccessible due to long distances and lack of affordable means of transport.

Only half the population was found to be living within five kilometers of a health unit (UNDP, 2000).

A recent review of human resources for health indicates a worrying shortage of well trained health personnel in the country. Uganda, with a population of 26 million people, has just over 2000 medical doctors registered with the Uganda Medical and Dental Practitioners' Council, many of whom are expatriates serving on a temporary basis. According to the ministry of health, 25% of all registered doctors are foreign workers coming to Uganda on a short-term basis (MoH, 2000; Matsiko, and Kiwanuka, 2003).

Health indicators are also very poor (see table 2 below), gravely confounded by the HIV/AIDS epidemic.

Table 2: Salient Health Statistics for Uganda, 2000- 2005

INDICATOR	VALUE
Total Population (in Millions)	26.8*
Population Growth Rate (%)	2.9
Total Fertility Rate (births per woman)	6.9
Maternal Mortality Ratio (per 100, 000)	504
Births Attended by Trained Personnel (%)	38
Infant Mortality Rate (per 1, 000 live births)	88
Under 5 Mortality Rate (per 1, 000 live births)	152
Life Expectancy at Birth (in years)	43
Population per doctor	18,700
Population per nurse	3,065
Population per hospital bed	870
Per capita health expenditure	$12.00
Per capita expenditure on drugs	US $ 0.8

Full Immunization Coverage (%)	38
HIV Prevalence Rate (%)	6.1
Population Without Access to Safe Drinking Water	40
Stunted Children Under Five Years (%)	39
Poverty Level (%)	35
Literacy Rate (%)	74
GDP per Capita (in US $)	

* The 26.8 million population total is from the 2002 Uganda Population and Housing Census. The current Uganda Population and Housing Census (2006) estimates the population at 33 Million.

Source*: UDHS 2000/01 and Uganda Census 2002*

There is considerable lack of access to primary health care services, especially in the rural areas, where over 30% of all pregnant women have no access to antenatal care by a trained health worker. Uganda's health indicators are generally poor, partly because of low levels of funding for the health sector and the high costs of medical care. A substantial part of the national budget also goes to buying arms for fighting the civil conflict in the northern and other troubled parts of the country, leaving the health sector largely underfunded. Consequently, preventable diseases such as cholera, malaria, and tuberculosis continue to afflict communities, devastate families, and kill or disable individuals. The infant mortality rate is 88 per 1000 live births, life expectancy has dropped from 54 to 43 years as a result of the HIV/AIDS epidemic, and by 2002 the national immunization coverage had reached only 46% of its target (Budget Speech, 15th June 2002).

Uganda continues to face an enormous public health dilemma, severely complicated by the HIV/AIDS epidemic and other emerging health disasters, such as the

horrifying Ebola outbreak that hit the country in 2000/2001, claiming over two hundred lives including medical personnel (IHSD, 2004; WHO, 2001). It is within such a broken health system that the HIV/AIDS pandemic started taking its toll on the Ugandan population.

The HIV/AIDS epidemic continues to decimate the Ugandan population at considerably menacing rates. The Uganda Ministry of Health has estimated new infections in 2002 alone at 70,170 cases, new AIDS cases at 73,830, and AIDS deaths at 75,290 people. Women are the leading victims of the epidemic, accounting for 55.2 percent of reported adult infections (ACP & MoH, 2003).

In 2005, the Executive Director of the Uganda Aids Information Centre (AIC), Hitimana Lukanika, recently estimated that about 15 million Ugandans, in a country of 26 million, are not aware of their HIV/AIDS status (Monitor, 2005). Undoubtedly, such a report leads one to question the efficacy of the overall intervention strategy. Fives later, the estimated percentage of people unaware of their HIV/AIDS status remains about the same. Experts believe that complacency and the 'normalization' of AIDS may be leading to an increase in the risky behavior that early prevention campaigns sought to reverse (GoU & UNGASS, 2010).

The demographic and socioeconomic profile of Uganda discussed in this chapter helps contextualize this study, highlighting some of the critical turning points in Uganda's struggles to be a nation that assures good health to its residents. The context characteristics

examined in this study arise out of a history of political and economic instabilities that still persist to date – and are made worse by the non-relenting HIV/AIDS epidemic.

CHAPTER FOUR: DATA, MEASUREMENT OF VARIABLES, AND ANALYSIS METHODS.

In this chapter, I present the dataset used in the analysis, definitions and descriptions of variables, explanation of data management and measurement procedures, an overview of multilevel modeling, including regression diagnostics, and a discussion of descriptive statistics.

Characteristics of the Data and Sampling

The data used in this study are from the 2000/01 Uganda Demographic and Health Survey (UDHS). The survey is the third wave of data collection efforts (in a series that started in 1988), and one of the most comprehensive nationally representative population and health surveys conducted in Uganda, as part of the worldwide Demographic and Health Survey project (DHS). Demographic and Health Surveys are large-scale household sample surveys conducted by governments, with support from international organizations and institutions, such as Macro International, specific United Nations agencies, and the United States Agency for International Development (USAID). These surveys are carried out at periodic intervals in approximately fifty countries across Africa, Asia, the Middle East, Latin America, and former Soviet Union. In each country, the DHS program collects information about a large number of health, nutrition, population and health service utilization measures, HIV/AIDS, as well as data on respondents' demographic, social and economic characteristics.

Using a standard set of questionnaires, data were collected at the individual, household and community levels. The 2000/01 UDHS collected information from a sample of men and women in the reproductive age groups of 15 – 54 and 15- 49 years, respectively[3]. Utilizing a sampling frame based on the 1991 Uganda Population and Housing Census, the UDHS sample was designed to provide estimates of key population and health indicators, including fertility and mortality at country, rural/urban, and regional levels. The sample was drawn through a two-stage design. The first-stage sample frame is the list of enumeration areas (EAs) or clusters compiled from the 1991 Uganda Population and Housing Census. In this sampling frame, EAs were grouped by parish within a sub-county, by sub-county within a county, and by county within a district (UBOS & ORC Macro, 2001). These enumeration areas are referred to as neighborhoods or communities in this study.

A total of 298 EAs (102 urban and 196 rural) were selected. Within each selected area, a complete household listing was created, which provided a basis for second-stage sampling. The number of households selected from each enumeration area was proportionally allocated, according to the number of households in that area. Overall, the

[3] The 2000/01UDHS report does not explain why there is a difference in the age range of men and women included in the survey. However, when I sent an inquiry to the Macro International about this, a data archive administrator (Bridgette Wellington) sent me the following explanation, which I find justifiable: "Women traditionally marry older men, so the age group for male respondents is increased to ensure that we interview a woman's husband who is older than her (e.g., a 49 year old woman, married to a 52 year old man). If we miss these men, then it becomes a problem creating the couples' file. If the unit of analysis [for example] is the couple, there might be some inaccuracies, due to men (husbands) not being interviewed because they are years older than their wife. To avoid this, we interviewed men aged 15 – 54" (Wellington, 2010).

UDHS selected 8,792 households, of which 7,885 were successfully interviewed, yielding a 96% household response rate (7,717 women and 2,306 men) (UBOS & ORC Macro, 2001).

Description and Measurement of the Variables Used in the Analysis

Before describing variables included in the analysis, I must mention that the data used in the study are characterized by a hierarchical structure – in which individuals are nested within neighborhoods - calling for a multilevel analysis approach, with two levels of analysis. Multi-level analysis refers to statistical methodology which simultaneously links outcomes to determinants measured at different levels -- such as individual (level-1) and neighborhood (level-2). Multilevel analysis can help to assess whether an individual's behavior is shaped not only by individual characteristics, such as individual income, but also neighborhood or contextual characteristics, such as income distribution, or the religious composition of a neighborhood (Krieger, 2001; Raudenbush & Bryk, 2002).

In this study, level-1units are individuals, and level-2 units are neighborhoods. Utilizing multilevel modeling, I assess the effects of individual (level-1) socio-demographic characteristics and neighborhood/contextual characteristics (level-2) on HIV protective and infection-risk behaviors among men and women in Uganda. A detailed description of multilevel modeling, and the particular procedure employed in this study, will be presented in chapter five (the analysis chapter).

Variables presented below include dependent variables and independent variables grouped into two groups: individual sociodemographic characteristics and neighborhood or contextual characteristics.

Dependent Variables:

As noted above, the dependent variables included in the analysis are: HIV testing, multiple sexual partnering, and inconsistent condom use. These three variables were chosen for this study because of their prominence, in recent studies on HIV infection-risk, as direct causal factors of infection. There are other variables that would have been appropriate to consider as dependent variables in this study, such as prevalence of sexually transmitted infections (STIs). However, this has not been possible due to limitations of data availability (data on STIs collected by the 2000/01 UDHS are inadequate, with a very low number of cases).

HIV Testing:

In an attempt to fill the gaps in the existing studies on HIV prevention, such as the assumption that sexual behavior is fundamentally a function of rational calculation and ignoring the complex power dynamics of sexual relationships, this study seeks to assess the extent to which a range of structural and socio-cultural factors, such as socioeconomic

status and attitudes regarding domestic gender power relations, may influence the protective practice of taking an HIV test.

In the 2000/01 UDHS, respondents were asked "whether they had ever been tested for HIV," with the answer categories 'yes' and 'no.' The dichotomous variable HIV testing is coded yes = 1, no = 0.

Multiple Sexual Partnering

The multiple sexual partnerships variable is based on the question asked of all sexually active men and women in the 2000/01 UDHS: "In the past 12 months, how many people other than your spouse/regular sex partner have you had sex with?"

It is worth highlighting that in the construction of the multiple sexual partnering measure/variable, both married/partnered and unmarried/unpartnered individuals were surveyed. Nevertheless, sex between respondents who are married or partnered is not considered multiple sexual partnering. It is only the sex they have had with someone other than their spouse/partner that is considered in the multiple sexual partnering category. For those who are not married or partnered, all the sexual encounters they reported count as multiple sexual partnering, and thus included in the category.

A multiple sexual partnering dichotomous variable was created, with respondents reporting two or more casual sex partners coded as 1, and respondents who did not coded as 0.

Inconsistent Condom Use

The variable inconsistent condom use (Non-use/inconsistent use = 1) derives from the survey question in the 2000/01 UDHS, "Did you use a condom the last time you had sexual intercourse?" In a study involving condom use for disease prevention, it is appropriate for analyses to focus on condom use in high-risk sexual encounters. For example, it would be prudent to assume that in a monogamous relationship with a monogamous partner, there is theoretically no risk of HIV infection, and therefore condom use is not necessary. But it is also important to note that not all marriages are monogamous, and not all marriages (monogamous or non-monogamous) are free of infidelity or extra-marital sexual encounters – and given the challenges assorted with data on sexual behavior, as noted above in case of multiple sexual partnering. It becomes even more complicated to give a candid report on extra-marital sexual practices among married/partnered individuals, for fear of potential reprisals from spouses/partners. Thus, in this study, analyses of condom use only include unmarried/non-cohabiting respondents (n = 433 men and 843 women).

Independent Variables:

I present independent variables in two groups: Individual (level-1) variables, and neighborhood/contextual (level-2) variables.

Individual (level-1) Independent variables

At level-1, predictors include age, education, socioeconomic status, marital status, domestic violence tolerance, and three religion dummy variables (Catholic, Protestant, and Other religion).

The age variable used in this analysis is a continuous variable measured in years, ranging from ages 15 to 54 for men and 15 to 49 for women.

Education is expected to play a role in influencing human behavior, including HIV infection-risk behavior, since it has the potential of conferring status and income, as well as giving access to HIV prevention messages (in print and audio-visual media). Education attainment in Uganda stretches between 1 and 16 years of schooling. The education system is a four-tier model, consisting of seven years of primary education, followed by a four-year cycle of lower secondary, which ends in the award of a Uganda Certificate of Education (UCE), and then a two-year cycle of upper secondary - which ends in the award of a Uganda Advanced Certificate of Education (UACE). After the secondary level, there is two to five years of tertiary education (where students may earn certificates, diplomas, or degrees). There is also a two-year pre- primary stage of education attended by three to five year olds before joining primary school, but this stage is not a requirement for entry into primary school. The 2000/01 collected data on participants' level of education, and this variable is measured in years of schooling.

Similar to educational attainment, socioeconomic status is expected to influence the nature of the sexual networks by conferring status, income, and access to resources,

thus affecting sexual behavior related with HIV infection-risk. Due to lack of data on traditional measures of income and expenditure in the Uganda 2000/01 Demographic Health Survey, which is the source of data for this study, an index of household wealth based on the ownership of certain household assets is used to measure socioeconomic status. This wealth index was developed for the World Bank in 1998 (Filmer & Pretchett, 1998). Using the principal components analysis method, Filmer and Pretchett tested the index in a large number of countries with regard to its relationship to inequities in household income, use of health services, and health outcomes (Filmer & Pretchett, 1998; Rutstein & Gwatkin, 2000). It is an indicator of wealth that is consistent with, although different from, expenditure and income measures. The asset information was collected through the DHS household questionnaire, which focuses on household ownership of a number of consumer items ranging from a television to a bicycle or car, as well as residence characteristics such as type of drinking water available, sanitation facilities used, roofing and flooring materials. Each asset was assigned a weight (factor score) generated through principle components analysis, and the resulting asset scores were standardized in relation to a standard normal distribution with a mean of zero and a standard deviation of one (Gwatkin et al. 2000).

Marital status is included in this study, as previous studies have found associations between HIV status and marital status (N Zungu-Dirwayi, et al., 2004). Marital status, in this study is derived from a UDHS 2000/01 survey question (asked to men and women): “Are you currently married or living with a partner?” Three answer

options were provided to the respondents: (1) “Yes, currently married,” (2) “Yes, living with a partner,” (3) “No, not in union.” The marital status variable used in the analysis is a dichotomous variable – where the currently married and living with a partner categories have been coded as “married or partnered” (yes = 1), and the Not in Union category coded as “unmarried” (no = 0).

Domestic violence tolerance tends to breed imbalances in domestic gender power relationships, often culminating into domestic violence against women – and may affect one’s health-seeking behavior, such as taking an HIV test. The domestic violence tolerance variable derives from a survey question asked to respondents (men and women) in the 2000/01 UDHS, seeking their opinions on whether or not a husband should beat his wife, given different domestic scenarios: “Sometimes the husband is annoyed or angered by some of the things his wife does. In your opinion, is a husband justified in hitting or beating his wife in the following situations?” Five scenarios, where respondents had to answer ‘yes’ or ‘no’ were presented: “If wife burns the food,” “ if wife argues with husband,” “if wife goes out without informing the husband,” “if wife neglects the children,” and “if wife refuses to have sexual intercourse with him.” The five scenarios outlined above are computed to create the domestic violence tolerance variable which is a dichotomy, with all respondents who answered “yes” to at least one scenario coded as 1.

Religion can also shape sexual behavior because it opens doors to all sorts of social networks, and may also influence the type of sexual practices considered desirable or acceptable by an individual, based on doctrinal teachings of religious leaders. In this

study, religion is coded into four dummy variables: 'Catholic' (1 = yes), 'Protestant' (1 = yes), and 'Other religion' (1 = yes), and Muslim. Other religion includes traditionalists and animists, as well as all those who answered "no religion" on the survey. The omitted category is Muslim.

Level -2 (Neighborhood) Variables

Neighborhood or contextual (level-2) variables used in the analysis include: Average age, place of residence, average level of education, average socioeconomic status, marital composition (Proportion Married), composition of domestic violence tolerance (Proportion Domestic Violence Tolerance), and religious composition (Proportion Catholic, Proportion Protestant, and Proportion Other religion).

The level-2 variables outlined above characterize neighborhoods, and are operationalized as indicators of neighborhood-level constructs. All the neighborhood characteristics outlined (with the exception of place of residence, which was originally created as a neighborhood-level predictor) are derived variables constructed by aggregating individual-level predictors.

Aggregate is a term used in multilevel modeling to refer to variables characterizing higher-level units, for example, neighborhoods in this study (Raudenbush & Bryk, 20002; Krieger, 2001). Aggregate variables are constructed by combining information for the lower level units of which the higher level unit is composed, such as individuals within a neighborhood. Examples of aggregate data may include the

percentage of individuals in a neighborhood with 16 years of schooling, or the mean income of neighborhood inhabitants. Despite the use of analogous variables at the individual-level, aggregate variables – such as mean neighborhood socioeconomic status (which is an aggregate of individual socioeconomic status)--provide important information on neighborhood level constructs, distinct from information provided by individual-level socioeconomic status, because they measure the effect of neighborhood level processes on the phenomenon observed at the individual level, such as taking an HIV test or using a condom (Blalock, 1984; Susser, 1994; Guo & Zhao, 2000).

With this hierarchical data structure, multilevel modeling allows the simultaneous examination of the effects of neighborhood-level and individual-level variables on individual-level outcomes, while accounting for the non-independence of observations within neighborhoods. By including neighborhood variables, therefore, this study seeks to examine the effects of neighborhood characteristics on individual-level outcomes. Neighborhood variables are included together with individual level variables - with individuals as the units of analysis.

In multilevel modeling, where level-1 intercepts become outcome variables at level-2, it is very important that the specific interpretation of these parameters is fully understood. In the simple level-1 model $Y_{ij} = \beta_{0j} + \beta_{ij} X_{ij} + e_{ij}$, for example, the intercept β_{0j} is the expected outcome for a resident living in neighborhood j, who has a value of zero on X_{ij}. This suggests that if one is to make sense of models that account for variation in intercept β_{0j}, the metric of all predictors must be given serious thought for the

interpretation of results to be meaningful. The interpretation of the intercept may pose serious challenges in cases where the value of zero is meaningless (e.g., age in a sample of adults). Although the metric stability of estimation is not affected by the metric of level-2 variables, a suitable choice of metric standardization is necessary for level-2 predictors, as well as for higher levels, in more complex models, such as those involving 3 levels – and must be properly addressed (Raudenbush & Bryk, 2002).

In an effort to make intercepts more interpretable, a number of researchers have discussed 'centering' as one of the useful ways to rescale predictors (Raudenbush & Bryk, 2002). Centering describes the rescaling of predictors to standardize the metric of measurement – and it may be done to correct for the challenges discussed above, or various other challenges posed by different variables and researcher interests. There are three possible options for centering: 1) Grand-mean centering where the grand mean is subtracted from each individual's score on the independent variable. With grand-mean centering, the intercept β_{0j} is the expected value of a resident, for example, whose value on predictor X_{ij} is equal to the grand-mean. Thus, the intercept is interpreted as the adjusted mean for level-2 units (neighborhoods); 2) Group-mean centering where the group mean is subtracted from each individual's score on the predictor. In group-meaning centering, the intercept is interpreted as the unadjusted mean for level-2 units (neighborhoods), since groups/neighborhoods are centered around their own means; and (3) raw metric approach where no centering is done. Here, the level-1 predictors retain their original metric.

In this study, three level-1 predictors (SES, Age and Level of education) are group-mean centered, while all the rest of the level-1 predictors are uncentered. I used group-mean centering because the theoretical interest of the study is more about examining the impact of neighborhood level social influences and the relative social positions within those neighborhoods, such as relative deprivation, on individual HIV infection-related behavior. All level-2 predictors are grand-mean centered to ensure meaningful intercepts.

Throughout the analysis, I estimate one type of the multilevel model --- the random -intercept model. This is a model where there is only one random level-1 coefficient $\beta 0_j$. In such a model, all the independent variables' effects are fixed, or constrained to be invariant across all neighborhoods. For example, in a model with a single predictor, such as education, $\beta 01_j = Y_{20}$, where Y_{20} is the common effect of education in every neighborhood. I decided to estimate this type of models after experimenting with a series of random-coefficient models and found them unnecessary for this study, because after controlling for all neighborhood predictors, there was no significant variance left to be explained on the neighborhood level.

Missing Data Management

In survey-based studies such as the one I undertake here, one of the challenges that usually arise is that of missing data. While multivariate analysis procedures generally assume that each neighborhood and each individual has complete data, in many

cases neighborhoods may be missing values on one or more of the variables under investigation. This may affect the generalizability of the research findings, and/or any conclusions drawn from those findings (Raudenbush & Bryk, 2002).I deal with missing data using 'listwise' deletion procedure (also known as 'casewise' deletion), which is an option available in the multilevel modeling software used for this analysis (HLM 6). A major weakness of the 'listwise' deletion procedure is the reduction of the effective sample size to only cases with complete data, thus potentially making the sample too small for meaningful analysis in many instances. However, in this case, there is sufficient number of cases at both the individuals and neighborhoods levels to support the analysis after applying 'listwise' deletion. At the individual level, listwise deletion reduces the women's sample from 7,717 to between 7, 246 and 7, 223, and the men's sample is reduced from 2,306 to between 1,962 and 1, 960, while at level-2, neighborhoods are reduced from 298 to 293 and 297 for men and women, respectively (see tables 3 and 4).

Overview of Multilevel Modeling and its Merits

Given that this study examines nested data - where individuals are nested in neighborhoods or communities, I use multilevel modeling, as noted earlier in this chapter. This analytical technique is preferred because standard multiple regression techniques, such as OLS, are not suited for nested data (Breslow & Clayton, 1993; Burdick & Graybill, 1988; Burstein et al., 1980; Raudenbush & Bryk, 992; 2002). Typically, members in a group such as a neighborhood are not independent—they are more similar

to each other than to others outside their group. Therefore, traditional techniques, such as Ordinary Least Squares (OLS) regression analysis, which require independence of observations as a one of the primary assumptions for the analysis, are rendered inappropriate (Raudenbush & Bryk, 2002). Multilevel modeling is a superior technique, because it partitions the unexplained variance, providing both an estimate of how much of the variance in the model is due to differences across groups (neighborhoods in this study), and how much is due to individual differences among the members of each group.

Multilevel modeling solves the challenge of underestimated standard errors by incorporating a unique random effect for each neighborhood into the model. This allows for the variability in these random effects to be taken into account, in the estimation of the standard errors.

In multilevel studies where sample members (individuals) are nested within neighborhoods, such as this study, the dependent variables are measured at the individual level, and the independent variables include both individual-level factors and aggregate measures of neighborhood characteristics. One of the major motivations that attract an interest to multilevel modeling is the practice of examining hierarchical social structures. In such investigations, the appeal of multilevel models stands out to many sociologists, because social structure is usually hierarchical. Throughout society, one finds ample instances of multilevel social structure. In this study, for example, individuals (level 1) are clustered in neighborhoods or communities (level 2).

Multilevel modeling has numerous advantages. First, a multilevel model provides a convenient framework for studying multilevel data. Such a framework encourages a systematic analysis of how covariates measured at various levels of a hierarchical data structure affect the dependent variable. In this study, for example, I examine the influence of neighborhood characteristics, such as average socioeconomic status and community religious composition on individual action of taking an HIV test or not taking one (Guo & Zhao, 2000; Raudenbush & Bryk, 2002).

Second, multilevel modeling corrects for the biases in parameter estimates resulting from nesting. Ignoring a multilevel structure can result in biases in the estimates of both parameters and their standard errors. The more highly correlated the observations are within clusters (neighborhoods), the more likely it is that ignoring clustering would result in biases in parameter estimates (Guo & Zhao, 2000).

Third, estimates of the variances and covariances of random effects at various levels allow researchers to decompose the total variance in the dependent variable into segments associated with each level. For example, using the 1987 National Survey of Maternal and Child Health in Guatemala, Pebley et al (1996) modeled a binary variable indicating whether a child has received a full set of immunizations as a function of observed variables at the individual level and the community (neighborhood) levels. After controlling for observed variables, they showed that the variance due to families is about five times larger than that due to communities.

Fourth, multilevel modeling provides correct standard errors as well as correct confidence intervals and significance tests. Therefore, when observations are nested into higher-level units, such as neighborhoods, the observations are no longer independent – and a good analysis technique should take this reality into account. Multilevel modeling does that.

The Operational Logic of Multilevel Modeling

The General Multilevel Model

Before I present the binary multilevel model, I first describe the multilevel linear model in its most general form, as a starting point. For more detailed descriptions, see Mason et al (1983), Bryk & Raudenbush (1992) Goldstein (1995), Guo & Zhao (2000), and Hox (2002). I only present a simple two-level model with a single explanatory variable:

$$\boldsymbol{Y_{ij} = \beta 0 + \beta 1 x_{ij} + uj + e_{ij},} \quad \textbf{(1)}$$

where y_{ij} is the dependent variable for the ith unit at level one and the jth group at level two; $\beta 0$ is the intercept, x_{ij} is the value of the independent variable, and $\beta 1$ is its effect. Uj is a random effect accounting for the random variation at level two, and e_{ij} is the level-one random effect. The parameters for the random effects are $E[uj] = E[e_{ij}] = 0$, $var(uj) = \sigma_u^2$, $var(e_{ij}) = \sigma_e^2$, $cov(uj, e_{ij}) = 0$, and $cov(uj, uj') = 0$ for $j \neq j'$. The within-cluster or intraclass correlation after controlling for the independent variable can be obtained from: $\rho = \sigma_u^2 / (\sigma_u^2 + \sigma_e^2)$.

Multilevel Modeling for Binary Outcomes

Recent years have seen a considerable increase in the number of applications of multilevel models, and in particular for data with binary dependent variables (Rountree & Land, 1996; Raudenbush & Bryk, 2002).

In this illustration of modeling binary outcomes, I first consider a two-level model with a single explanatory variable. Conceptually, this model is equivalent to model (1) above, except for the outcome variable. For example, in this study, where the data consists of individuals grouped into neighborhoods (level 2), we observe y_{ij}, a binary response for individual i in neighborhood j and x_{ij}, an explanatory variable at the individual level. We define the probability of the response equal to one as $p_{ij} = Pr(y_{ij} = 1)$ and let p_{ij} be modeled using a logit link function. The standard assumption is that y_{ij} has a Bernoulli distribution. Then the two-level model is written as follows:

$\log[p_{ij} /(1 - p_{ij})] = \beta 0 + \beta 1 x_{ij} + uj$ *(combined model)* (3)

where uj is the random effect at level two. Without uj, (3) would be a standard logistic regression model. Conditional on uj, y_{ij} values are assumed to be independent. As in the case of multilevel linear models, uj is assumed to be normally distributed, with the expected value 0 and the variance σ_u^2. In the literature on multilevel models, model (3) is often alternatively described by Equations (4) and (5) below:

$\log[p_{ij} /(1 - p_{ij})] = \beta 0 j + \beta 1 x_{ij}$ *(level* 1 *model)* (4)

$\beta 0 j = \beta 0 + uj$ *(level* 2 *model)* (5)

Relative to equations (4) and (5), equation (3) is usually referred to as the combined (or mixed) model. Model 3 is the simplest possible multilevel model for binary data. As can be seen above, there is no level-1 residual term in the level-1 model because for binary dependent variables, the variance is completely determined by the mean. As a result, a separate level-1 error term is not estimated – instead, level-1 residual variance is always fixed to $\prod^2/3 = 3.29$ (Luke, 2004).

My model building process included estimating models without predictors, also known as the fully unconditional models as well as level-specific models, that is, random intercept models with only level-1 predictors or only level-2 predictors. The final models were random intercept models with both level-1 and level-2 predictors.

Regression Diagnostics

I extensively use various regression diagnostics, including lowess charts to assess linearity, histograms to examine normality, and tolerance and variance inflation factor (VIF) scores to assess the presence of multicollinearity. Multicollinearity occurs when two or more independent variables are highly correlated. To improve normality, I perform appropriate transformations where needed (see sub-section on level-2 variables for transformed variables).

The existence of multicollinearity may inflate the variances of parameter estimates, resulting in lack of statistical significance of individual independent variables. It may also result in wrong signs and magnitudes of regression coefficient estimates, and

consequently in incorrect conclusions about relationships between independent and dependent variables (Tabachnick & Fidell, 2001).

In an effort to mitigate the threat of multicollinearity, I examine variance inflation factor scores produced of all variables included in the analysis to detect if multicollinearity (Tabachnick & Fidell, 2001). The variance inflation factor score is the ratio of a variable's total standardized variance to its unique variance. Tabachnick & Fidell (2001) suggest that if the values of the variance inflation factor scores do not exceed a value of ten (10), multicollinearity should not be considered a threat to the analysis. As noted above, exploratory tests to assess linearity were conducted, using a series of techniques, including data-based graphs such as lowess charts and scatter plots. Where necessary, transformations performed to ensure linearity and improve distributional properties: Socioeconomic status was transformed to its natural log, and a squared term was computed for age (after mean-centering).

Descriptive Statistics of the Variables Included in the Analyses

Tables 3 and 4 below present descriptive statistics of the variables included in the analysis- indicating the number of cases, the mean, standard deviation, minimum and maximum value of variables. Neighborhood variables (with the exception of place of residence) are computed aggregates (derived variables) corresponding to individual variables.

Table 3 shows that 12% of men reported taking an HIV test, while Table 4 demonstrates that 10% of the women reported taking a test (table 4) - - and it appears that men are more likely to admit and report multiple sexual partnering behavior: 22% of men reported such behavior compared to 12% of women. Despite appeals to social desirability – which some scholars have cited as a potential cause for women to underreport their sexual behavior (Carael, et al. 2001; 2005), this result is probably expected. In Uganda, it is men who tend to switch sexual partners much more frequently than women, and many times, they are more likely to have concurrent causal sexual partners.

Among those with multiple sexual partners, women are more likely to be inconsistent condom users, with 57% of them reporting inconsistent use, as compared to 37% of men. This is not surprising, because in many sexual encounters, men tend to take an upper hand in deciding whether to use a condom or not, particularly in patriarchal households, such as those in Uganda.

On average, men who participated in the survey were slightly older than women, with average ages of 29 and 27, respectively. And at the community level, the average age is also slightly higher among men than among women, by a similar margin (see tables 3 and 4).

The results also show men with an upper hand in education, registering about 7 years of education on average (at least completed primary school), compared to women with 5 years (less than primary school). This is not unexpected in Uganda, where for

many years, girls' education was not given as much priority as that of boys. The reason is rooted in a cultural philosophy that prepared girls for marriage and childbearing as the major occupation. A lot of progress has been made since the 1980s in terms of creating opportunities for girls to go to school and treating them equally with boys when it comes to education, but a lot more still needs to be done. In recent years, adult education has also been included in the agenda for nation building and poverty eradication, and a lot of adult women have entered schools. There is no difference between men and women in terms of reported individual socioeconomic status. However, at the neighborhood level, the socioeconomic status is much higher in neighborhoods with higher concentrations of men than women. In terms of marital status, 65% of women reported being married or partnered, which was much higher than the corresponding percentage for men, 53%. However, the difference in the community composition of married/partnered men and women is much less pronounced (an average community contained 65% of married women and 62% of married men).

The level of domestic violence tolerance among women is higher than among men, with 62% of women reporting tolerance to domestic violence, compared to 53% of men. At the community level, however, it is the reverse – where domestic violence tolerance in communities with high concentrations of women is much less (6%), compared to communities with high concentrations of men at 52%. This might be explained by the confidence facilitated by collective action and growing collective consciousness, due to women empowerment campaigns that tend to target women in

communities, than individual women. More men than women reported religious affiliation than women --- with men reporting 85% Christian (Catholic and Protestant combined), compared to 50% for women, and there is also a much higher religious composition of men, than women at the community level.

Table 3: Descriptive Statistics of Variables Used in the Analysis for Men

	N	Mean	SD	Minimum	Maximum
Individual Characteristics					
Dependent Variables					
HIV Testing	1962	0.12	0.33	0	1
Multiple Sexual Partners	1962	0.22	0.41	0	1
Inconsistent Condom Use	433	0.37	0.48	0	1
Independent Variables					
Age (in years)	1962	29.08	10.27	15.00	54.00
Level of Education	1840	6.64	3.93	0.00	16.00
Social Economic Status (log)	1962	0.18	0.24	0	1.5
Married or Partnered	1962	0.59	0.49	0	1
Domestic Violence Tolerance	1960	0.53	0.5	0	1
Catholic	1961	0.42	0.49	0	1
Protestant	1961	0.43	0.5	0	1
Other Religion	1961	0.02	0.15	0	1
Neighborhood Characteristics					
Average age	293	29.08	3.88	16.50	48.00
Place of Residence (1 = Rural)	293	0.66	0.47	0	1
Average Level of Education	293	6.88	2.58	0	15.50
Average Socioeconomic Status	293	0.16	0.15	0	0.7
Proportion Married or Partnered	293	0.62	0.25	0	1
Proportion Domestic Violence Tolerance	293	0.52	0.34	0	1
Proportion Catholic	293	0.42	0.29	0	1
Proportion Protestant	293	0.43	0.28	0	1
Proportion Other Religion	293	0.02	0.07	0	0.6

Table 4: Descriptive Statistics of Variables Used in the Analysis for Women

	N	Mean	SD	Minimum	Maximum
Individual Characteristics					
Dependent Variables					
HIV Testing	7223	0.1	0.3	0	1
Multiple Sexual Partnering	7237	0.12	0.32	0	1
Inconsistent Condom Use	855	0.57	0.5	0	1
Independent Variables					
Age	7246	27.43	9.03	15.00	49.00
Level of Education	7242	5.05	4.02	0	16
Socioeconomic Status (log)	7196	0.18	0.24	0	1.55
Married or Partnered	7246	0.65	0.48	0	1
Domestic Violence tolerance	7246	0.62	0.49	0	1
Catholic	7240	0.39	0.49	0	1
Protestant	7240	0.41	0.49	0	1
Other Religion x10	7240	0.57	2.32	0	10
Neighborhood Characteristics for Women					
Average Age	297	27.40	2.05	17.67	34.11
Place of Residence (1= Rural)	297	0.66	0.47	0	1
Average Level of Education	297	5.1	2.44	0.22	11.13
Average Socioeconomic Status	297	-0.03	0.4	-0.53	0.81
Proportion Married or Partnered	297	0.65	0.16	0.23	1
Proportion Domestic Violence Tolerance	297	0.6	0.2	0.08	1
Proportion Catholic	297	0.4	0.24	0	1
Proportion Protestant	297	0.41	0.23	0	1
Proportion Other Religion	297	0.58	0.99	0	7.71

CHAPTER FIVE: DATA ANALYSIS

Introduction:

In this chapter, I use multilevel logistic regression to assess the effects of individual (level-1) and neighborhood (level-2) socio-demographic characteristics on HIV protective and infection-risk behaviors among men and women in Uganda. The HIV protective and infection-risk behaviors included in this analysis are seeking knowledge of one's HIV serostatus (by taking an HIV test), which is a protective behavior, multiple sexual partnering (infection-risk behavior), and inconsistent condom use among non-cohabiting partners (infection-risk behavior). The analysis is presented in three sections: (1) I present and discuss descriptive statistics comparing means of all independent variables by values of each of the dependent variables for both men and women's data (2); I present and interpret multilevel logistic regression analyses results showing that there are important associations between socio-demographic factors (at both the individual and neighborhood levels) and individuals' involvement in HIV infection-risk or protective behaviors. Along with the presentation of tables, I discuss the results on each of the dependent variables, highlighting important findings. (3) I present a brief summary of the findings from all the analyses. Since in all models I analyze individual level characteristics while simultaneously controlling for neighborhood characteristics, I discuss individual and neighborhood results contemporaneously. Throughout the discussion, I compare results of men and women, both at the individual and neighborhood levels.

Descriptive Statistics Comparing Means

Tables 5a, 5b, 6a, and 6b show mean differences of independent variables on the dependent variables. Tables 5a and 5b show mean differences for men (individual level and neighborhood level), while tables 6a and 6b show mean difference for women.

From the analysis of mean differences, it is apparent that those who took an HIV test are significantly older than those who did not take the test among men (Table 5a) but not among women (Table 6a). Among both men and women, there is a significant age difference between those who reported having engaged in multiple sexual partnering and those who did not engage in the practice, whereby those who reported practicing multiple sexual partnering are younger than those who did not engage in the practice. There is no significant age difference among men between those who reported inconsistent use of condoms and those who did not (tables 5a and 5b). Among women, however, those who reported having engaged in inconsistent condom use were significantly younger than those who did not.

At the community level, women who took an HIV test live in communities that are younger on average than communities of those who did not take the test (table 6b); for men, there is no such difference on community level. Similarly, women who engage in multiple sexual partnering also live in younger communities than women who do not, but there is no such difference among men. Finally, there is no significant age difference on the community level in terms of inconsistent condom use for either men or women.

Place of residence, which is a neighborhood characteristic, shows a significant association with HIV testing behavior among women, whereby those who took an HIV test were less likely to be from rural areas than those who did not take the test. Also, more women from urban areas reported engaging in multiple sexual partnering than rural women.

There are significant differences in levels of education among individual men and women, between those who reported taking an HIV test, engaging in multiple sexual partnering, or using condoms inconsistently, and those who did not report participating in each of the three behaviors (HIV testing, multiple sexual partnering, and inconsistent condom use). Among men, those who reported taking an HIV test had higher levels of education than those who did not take the test. There is also a large educational difference between men who reported engaging in inconsistent condom use and those who did not engage in inconsistent condom use, whereby those who consistently use condoms have higher levels of education. With multiple sexual partnering, however, the educational difference between the men who engaged in multiple sexual partnering, and those who did not is quite small, albeit significant. At the community level, among men, there is no significant difference in average level of education in communities of those who reported having taken an HIV test, and those who did not take an HIV test. There are significant behavior differences due to educational composition of neighborhoods related to multiple sexual partnering and inconsistent condom use, however. Men in communities with high concentrations of highly educated residents are more likely to engage in multiple sexual

partnering than those in communities with lower concentrations of highly educated residents. Men who reported engaging in inconsistent condom use live in communities with significantly lower concentrations of educated people than those who did not engage in inconsistent condom use (table 5b).

Among women, those who took an HIV test are significantly more educated than those who did not take the test, and those who engaged in multiple sexual partnering have significantly higher levels of education than those who did not report engaging in multiple sexual partnering. Finally, women who reported engaging in inconsistent condom use are significantly less educated than those who did not engage in such behavior. At the neighborhood level, there is no significant link between the educational composition of the community and inconsistent condom use among women. There are, however, small but significant differences among women with regard to average community education and both HIV testing and multiple sexual partnering. Women in highly educated neighborhoods are more likely to engage in the protective practice of taking an HIV test than those in less educated neighborhoods. But women in highly educated communities are also more likely to engage in risky practice of multiple sexual partnering than those in less educated communities.

This suggests that while the highly educated appear to be generally more likely to engage in infection-risk behavior of multiple sexual partnering, they are also less likely to practice the risky behavior of inconsistent condom use and more likely to take HIV tests, as can been seen in tables 5a and 6a. This may not be surprising, because the highly

educated are more likely to have access to protective services through their networks, as well as general media channels, such as newspapers, radio and television messages, and are able to read messages on HIV prevention campaign billboards.

Significant behavior difference due to socioeconomic status position is observed in connection with multiple sexual partnering among both men and women at the individual level – whereby women and men who reported engaging in multiple sexual partnering have a higher level of socioeconomic status than those who did not engage in multiple sexual partnering. There is no significant association between individual socioeconomic status and whether or not one takes an HIV test for either men or women. Individual socioeconomic status also has no significant association with inconsistent condom use for either men or women. At the neighborhood level, socioeconomic composition of communities shows no significant association with either the protective behavior of taking an HIV test or the HIV infection-risk behaviors of multiple sexual partnering and inconsistent condom use among men and women (tables 5a and 6a).

Marital status shows a significant association with the practice of taking an HIV test among men, whereby those men who reported taking an HIV test were more likely to be married or partnered than those who did not take the test. Married/partnered men are also less likely to engage in multiple sexual partnering than those who are not married. There is no significant difference in condom use due to marital status among men, however. Married women are less likely to engage in multiple sexual partnering than unmarried women, and are more likely to report inconsistent condom use than unmarried

women. But there is no significant difference in marriage rate based on HIV testing behavior among women. At the community level, both men and women who engage in multiple sexual partnering live in neighborhoods with lower concentrations of married residents than those who do not engage in such partnerships. For both women and men, however, neighborhood marriage composition shows no significant association with either HIV testing or condom use.

Domestic violence tolerance among men shows a significant association with the practice of taking an HIV test, whereby those who took an HIV test are less likely to tolerate domestic violence than those who did not take an HIV test. There is also a significant difference in domestic violence tolerance between those who reported inconsistent condom use and those who did not, whereby inconsistent condom users are more likely to tolerate domestic violence than those who do not engage in inconsistent condom use. These findings apply to women as well: Women who reported having taken an HIV test were less likely to tolerate domestic violence than those who did not take an HIV test, and those who reported inconsistent condom use were more likely to tolerate domestic violence than those who did not report engaging in inconsistent condom use. For both men and women, there is no significant difference in domestic violence tolerance status between those who reported engaging in multiple sexual partnering and those who did not report practicing multiple sexual partnering. At the community level, it seems that men who reported engaging in multiple sexual partnering live in communities that are less likely to tolerate domestic violence than the communities of those who did

not report engaging in multiple sexual partnering. For women, domestic violence tolerance on the community level is significantly associated with HIV testing, whereby communities in which women who reported taking an HIV test reside are less likely to tolerate domestic violence than the communities of those women who did not report taking an HIV test. There is no significant difference in the neighborhood levels of domestic violence tolerance between those women who engaged in multiple sexual partnering and those who did not, and between those women who engaged in inconsistent condom use and those who did not. Among men, there are no significant differences in to neighborhood levels of domestic violence tolerance between those who reported taking an HIV test and those who did not and between those who engaged in inconsistent condom use and those who did not.

There is no significant difference with regard to religious affiliation among men between those took an HIV test and those who did not take the test, those who reported engaging in multiple sexual partnering and those who did not engage in multiple sexual partnering, and those who engaged in inconsistent condom use and those who did not. Among women, however, there is significant difference in religious affiliation (Catholic, Protestant, and Other religion) between those who reported engaging in multiple sexual partnering and those who did not engage in multiple sexual partnering: That is, those women who practice multiple sexual partnering are more likely to be Catholic and less likely to be either Protestant or other religion than those who do not engage in multiple sexual partnering. Female HIV test takers are also more likely to be Protestants than the

women did not take the test. Finally, among women, inconsistent condom users are more likely to identify with other religion than consistent condom users.

At the community level, among men, religious composition of communities shows no significant relationship to HIV testing and multiple sexual partnering practices. However, religious composition is associated with condom use, whereby those who reported using a condom inconsistently are more likely to be coming from communities that have higher Catholic and lower Protestant membership than those who do not engage in inconsistent condom use. In this regard, living in a predominantly Catholic community more often exposes individuals to the risky practice of inconsistent condom use than living in a community that is not predominantly Catholic in terms of its membership, and living in a predominantly Protestant community appears to be protective in this regard (table 5b).

Among women, Catholic religious composition is associated with condom use, whereby those who reported using a condom inconsistently are members/residents of communities that have a higher Catholic membership than the communities of those who did not report engaging in inconsistent condom use. Catholic community composition among women, however, shows no significant relationship to HIV testing and multiple sexual partnering (table 6b).

Protestant religious composition of communities among women is not associated with condom use. However, it shows links to HIV testing and multiple sexual partnering behaviors, whereby women who reported having taken an HIV test are residents of

communities with higher Protestant membership than the communities of those who did not report taking an HIV test; and women who reported engaging in multiple sexual partnering are residents of communities with higher Protestant membership than the communities of those who did not report engaging in multiple sexual partnering.

For both men and women, community composition of 'Other religion' shows no significant association with any of the HIV-related behaviors examined here (tables 5b and 6b).

Table 5a: Comparing Means of Individual Characteristics (Men)

	(HIV test=0)	(HIV test=1)	(Multi Sex=0)	(Multi Sex=1)	(No Condom=0)	(No Condom=1)
Independent Variables						
Age	28.837	30.816	29.969	25.915	25.636	26.385
	(0.253)	(0.537)***	(0.273)	(0.381)***	(0.425)	(0.730)
Level of Education	6.269	9.326	6.373	7.584	8.640	5.801
	(0.089)	(0.284)***	(0.099)	(0.189)***	(0.235)	(0.263)***
Socioeconomic Status (log)	-0.317	-0.215	-0.332	-0.210	-0.199	-0.227
	(0.022)	(0.063)	(0.023)	(0.048)*	(0.061)	(0.076)
Married or Partnered	0.581	0.695	0.665	0.349	0.364	0.323
	(0.012)	(0.030)***	(0.012)	(0.023)***	(0.029)	(0.037)
Domestic Violence Tolerance	0.545	0.414	0.525	0.540	0.463	0.671
	(0.012)	(0.032)***	(0.013)	(0.024)	(0.030)	(0.037)***
Catholic	0.420	0.410	0.428	0.388	0.368	0.422
	(0.012)	(0.032)	(0.013)	(0.023)	(0.029)	(0.039)
Protestant	0.430	0.448	0.433	0.432	0.441	0.416
	(0.012)	(0.032)	(0.013)	(0.024)	(0.030)	(0.039)
Other Religion	0.024	0.013	0.026	0.014	0.007	0.025
	(0.004)	(0.007)	(0.004)	(0.006)	(0.005)	(0.012)

Notes:
The first number is the mean, and the second number in parenthesis is the standard error
Statistical significance is indicated as follows: * $p \leq .05$; ** $p \leq .01$; *** $p \leq .001$

Table 5b: Comparing Means of Neighborhood Characteristics (Men)

	(HIV test=0)	(HIV test=1)	(Multi Sex=0)	(Multi Sex=1)	(No Condom=0)	(No Condom=1)
Neighborhood Characteristics for Men						
Average Age	29.391	29.697	29.707	28.619	28.710	28.481
	(0.283)	(0.803)	(0.319)	(0.468)	(0.630)	(0.703)
Rural Residence	0.673	0.583	0.734	0.453	0.333	0.633
	(0.029)	(0.083)	(0.030)	(0.058)***	(0.071)	(0.089)**
Average Level of Education	6.786	7.536	6.527	7.899	8.567	6.896
	(0.162)	(0.389)	(0.174)	(0.273)***	(0.350)	(0.375)***
Average Socioeconomic Status	-0.384	-0.280	-0.379	-0.348	-0.301	-0.418
	(0.055)	(0.139)	(0.057)	(0.110)	(0.146)	(0.169)
Proportion Married or Partnered	0.622	0.577	0.648	0.525	0.526	0.525
	(0.015)	(0.048)	(0.017)	(0.027)***	(0.038)	(0.037)
Proportion Domestic Violence Tolerance	0.528	0.506	0.560	0.423	0.343	0.543
	(0.022)	(0.056)	(0.023)	(0.038)**	(0.049)	(0.052)
Proportion Catholic	0.423	0.411	0.438	0.373	0.309	0.468
	(0.019)	(0.040)	(0.020)	(0.034)	(0.036)	(0.062)*
Proportion Protestant	0.423	0.475	0.423	0.449	0.503	0.369
	(0.018)	(0.043)	(0.019)	(0.032)	(0.038)	(0.053)*
Proportion Other Religion	0.018	0.031	0.021	0.015	0.020	0.006
	(0.004)	(0.013)	(0.005)	(0.006)	(0.009)	(0.004)

Notes:

The first number is the mean, and the second number in parenthesis is the standard error

Statistical significance is indicated as follows: * $p \leq .05$; ** $p \leq .01$; *** $p \leq .001$

Table 6a: Comparing Means of Individual Characteristics (Women)

	(HIV test=0)	(HIV test=1)	(Multi Sex=0)	(Multi Sex=1)	(No Condom=0)	(No Condom=1)
Independent Variables						
Age	27.430	27.192	27.786	24.524	22.808	25.828
	(0.113)	(0.288)	(0.114)	(0.274)***	(0.349)	(0.393)***
Level of Education	4.713	8.198	4.856	6.553	8.214	5.289
	(0.048)	(0.159)***	(0.050)	(0.143)***	(0.205)	(0.178)***
Socioeconomic Status (log)	-0.321	-0.260	-0.329	-0.211	-0.276	-0.162
	(0.012)	(0.034)	(0.012)	(0.031)***	(0.049)	(0.040)
Married or Partnered	0.646	0.640	0.712	0.145	0.092	0.185
	(0.006)	(0.018)	(0.006)	(0.012)***	(0.015)	(0.018)***
Domestic Violence Tolerance	0.631	0.474	0.618	0.593	0.531	0.640
	(0.006)	(0.018)***	(0.006)	(0.017)	(0.026)	(0.022)***
Catholic	0.395	0.371	0.386	0.449	0.442	0.455
	(0.006)	(0.018)	(0.006)	(0.017)***	(0.026)	(0.023)
Protestant	0.414	0.362	0.413	0.373	0.374	0.372
	(0.006)	(0.018)**	(0.006)	(0.017)*	(0.025)	(0.022)
Other Religion x 10	0.564	0.671	0.612	0.292	0.108	0.432
	(0.029)	(0.093)	(0.030)	(0.058)***	(0.054)	(0.092)**

Notes:
The first number is the mean, and the second number in parenthesis is the standard error
Statistical significance is indicated as follows: * $p \leq .05$; ** $p \leq .01$; *** $p \leq .001$

Table 6b: Comparing Means of Neighborhood Characteristics (Women)

	(HIV test=0)	(HIV test=1)	(Multi Sex=0)	(Multi Sex=1)	(No Condom=0)	(No Condom=1)
Neighborhood Characteristics for Women						
Average Age	27.590	26.871	27.689	26.457	26.221	26.614
	(0.144)	(0.339)*	(0.140)	(0.383)**	(0.642)	(0.482)
Place of Residence (1 = Rural)	0.680	0.467	0.696	0.425	0.313	0.500
	(0.029)	(0.093)*	(0.029)	(0.079)***	(0.120)	(0.104)
Average Level of Education	4.994	6.116	4.937	6.159	6.898	5.666
	(0.149)	(0.431)**	(0.147)	(0.428)**	(0.572)	(0.590)
Average Socioeconomic Status	-0.361	-0.384	-0.362	-0.376	-0.561	-0.253
	(0.054)	(0.142)	(0.054)	(0.134)	(0.224)	(0.164)
Proportion Married or Partnered	0.652	0.623	0.663	0.562	0.573	0.554
	(0.010)	(0.027)	(0.010)	(0.027)***	(0.025)	(0.041)
Proportion Domestic Violence Tolerance	0.614	0.512	0.618	0.517	0.548	0.497
	(0.012)	(0.040)*	(0.012)	(0.034)	(0.051)	(0.046)
Proportion Catholic	0.399	0.398	0.397	0.412	0.309	0.481
	(0.015)	(0.031)	(0.015)	(0.040)	(0.032)	(0.060)*
Proportion Protestant	0.411	0.376	0.420	0.333	0.385	0.298
	(0.014)	(0.033)*	(0.014)	(0.034)*	(0.031)	(0.051)
Proportion Other Religion x 10	0.584	0.531	0.513	0.988	0.764	1.138
	(0.063)	(0.112)	(0.052)	(0.263)	(0.213)	(0.417)

Notes:

The first number is the mean, and the second number in parenthesis is the standard error

Statistical significance is indicated as follows: * $p \leq .05$; ** $p \leq .01$; *** $p \leq .001$

Multilevel Logistic Regression Results

HIV Testing

In tables 7 and 8, I present the results of multilevel logistic regressions of HIV testing. Table 7 presents the results for men and table 8 presents the results for women. Educational attainment, measured by years of schooling, has a strong protective effect for both men and women when it comes to seeking knowledge of one's HIV status by taking an HIV test ($p \leq .001$). A one year increase in education increases the odds of taking an HIV test among men by an estimated 17%, and increases the odds for women by a similar, but slightly lower magnitude of 15% (Tables 7 and 8). Education is also strongly and positively associated with HIV testing at the neighborhood or community level (level-2) for both men and women – predicting increases in the odds of taking an HIV test of 20% among men and 27% among women per one year increase in the average educational level in the community. These findings imply that individuals with high levels of education, and communities occupied by such residents, are better able to reduce the risk of HIV infection than those with low levels of education through seeking knowledge of their HIV serostatus. These findings are consistent with some of the studies that have been done on educational attainment and the protective practice of HIV testing. A recent study of five African countries (Burkina Faso, Cameroon, Ghana, Kenya, and Tanzania) found a strong positive association between years of schooling and seeking an HIV test and voluntary counseling, particularly among women (De Walque, 2009).

Age is another consistent predictor of HIV testing among individual men and individual women (tables 7 and 8). However, the association follows a distinct inverted U–shaped curve (see figures 2 and 3 below).

Figure 2: U-Shaped Curve of Age and HIV Testing for Men

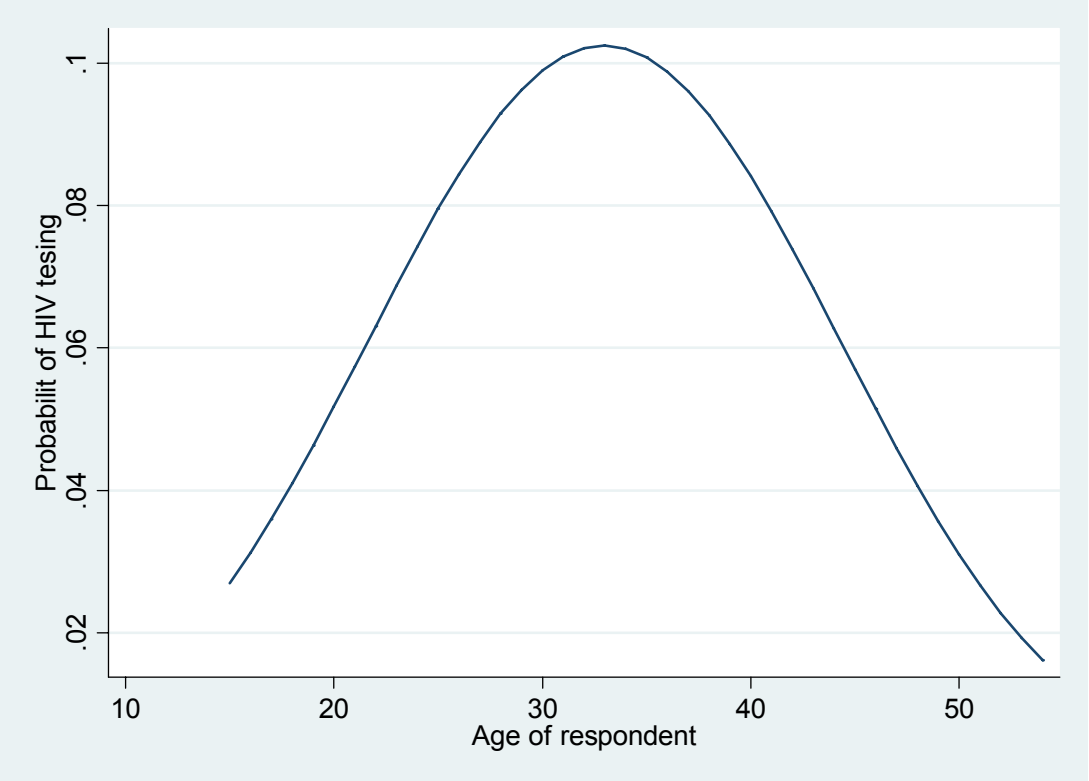
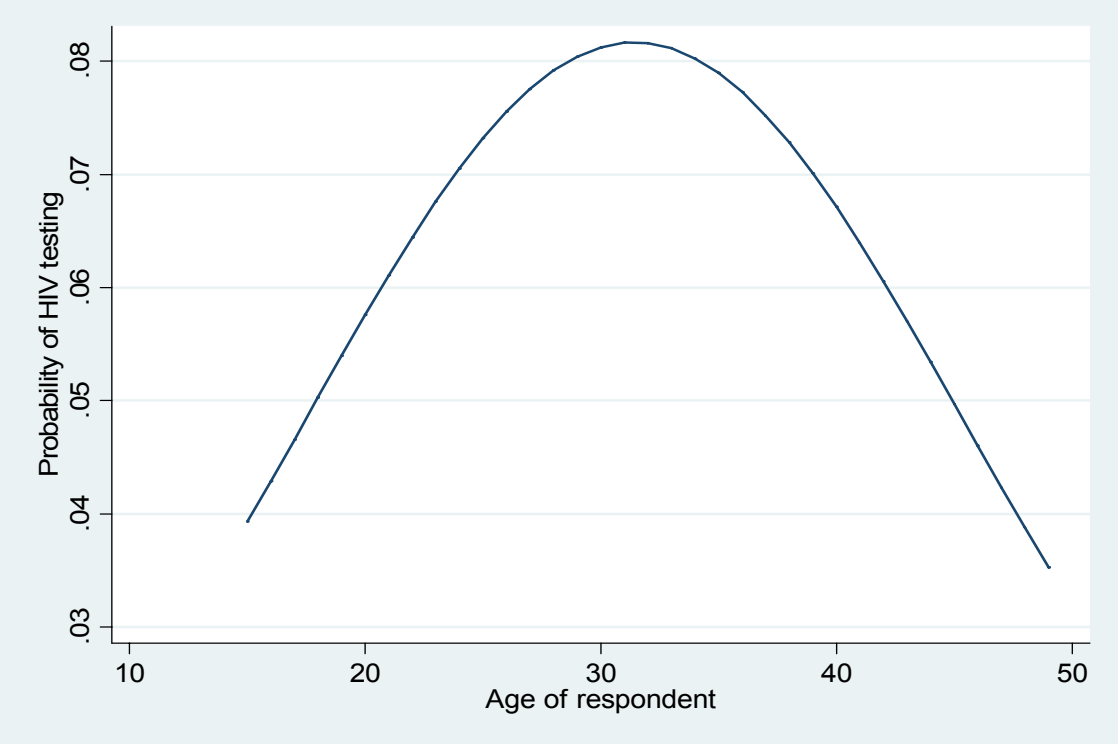


Figure 3: U-Shaped Curve of Age and HIV Testing for Women



Figures 2 and 3 above demonstrate the distinct inverted U–shaped curve associations for men and women, respectively. That is, the likelihood of taking an HIV test increases with age until between age 35 and 40, and then decreases as people grow older. These findings are consistent with other studies conducted in sub-Saharan Africa (De Walque, 2006; Fenton, 2004). De Walgue reports that, in sub-Saharan Africa, the turning point is usually between ages 30 and 40, but tends to start earlier for women than men. At the community level, average age has no significant association with the protective behavior of taking an HIV test.

While religious composition of communities has no effect on HIV testing behavior, religion at the individual level is significantly associated with HIV testing among women, but it does not predict men's behaviors related to HIV testing (see tables 7 and 8). This lack of significant association between religion and men's HIV testing behavior may not be surprising, given men's record in health-seeking behavior. In many societies, including Uganda, men's health-seeking behaviors are weak, and adherence to Church teachings related to health, sex and morality in general tends to be an uphill battle. For example, in their study on men's health-seeking behavior in Ireland, McEvoy and Richardson (2004) note that almost for every health condition common to both men and women, health outcomes for men tend to be poorer.

At the individual level, Catholic and Protestant women are less likely to take an HIV test than Muslim women. Being Catholic and Protestant, as compared to Muslim, reduces the odds of taking an HIV test by 24% and 28%, respectively. This finding might be explained by the sustained teaching of both the Catholic and Protestant church leaders against some HIV prevention messages advocated by HIV prevention intervention groups, such as using condoms. Despite the more than two decades of HIV prevention experience in Uganda, contracting HIV still carries a heavy stigma, and still regarded, among many Christian communities, as a result of loose sexual practices. Therefore, presenting oneself for a voluntary HIV test might also be perceived as an indicator that you probably did something wrong. A study of religion and protective behaviors against HIV infection in Senegal (Lagard, et al., 2000) also found a similar association – where

among those who reported HIV/AIDS to be a major health problem about which they needed to do something, in terms of adaptive protective behavior; the proportion of Muslims was higher than that of non-Muslims.

Marital status, which includes both those who are legally married and people living with a partner with the intention of staying together, is associated with HIV testing among women, but has no significant association among men. The odds of HIV testing for married or partnered women are 26% higher than for unmarried and unpartnered women. Although this finding might suggest that men and women are different on HIV testing behavior, we cannot make such a conclusion given the difference in sample size. The apparent difference is likely to be attributable to sample size differences (sample size for women is much higher compared to men) as the actual coefficient for marital status for men is actually larger than for women. In contrast to individual marital status, marriage composition of communities has no significant association with HIV testing for either women or men.

Place of residence, a neighborhood characteristic, is significantly associated with HIV testing among women, but there is no significant association among men. The odds of rural women taking an HIV test are 38% lower compared with their urban counterparts. This is an expected outcome, partly because HIV testing services are less available in Ugandan rural communities than urban communities, but also because of a host of other possible inhibitors, including stigma – whereby taking an HIV test might make you a topic of discussion in the family and village. It might also be interpreted as

mistrust of spouse for those who are married. There could also be real livelihood struggles such as food insecurity, constant attacks of malaria and other ailments among family members – which may move the perceived or real risk of HIV infection at the bottom of the pile of burdens to contend with on a daily basis, thus reducing the likelihood of engaging in HIV protective behaviors such as taking an HIV test. This finding calls for more community oriented interventions that bring HIV protective messages and services to the people, but also help to address other livelihood struggles that might deny individuals the time and ability to participate in the process and practices remaining free of HIV and AIDS.

Socioeconomic status has no significant association with HIV testing among individual men and women (tables 7 and 8); similarly, average community-level socioeconomic status is also not significantly associated with taking an HIV test for both men and women.

Domestic violence tolerance has no significant association with HIV testing among men, at either the individual or community level, and there is no significant association for women at the individual level as well. At the community level among women, however, domestic violence tolerance is associated with the protective behavior of taking an HIV test, whereby in communities with higher levels of domestic violence tolerance, women are less likely to take an HIV test.

Multiple Sexual Partnering

In tables 9 and 10, I present multilevel logistic regression analysis results for multiple sexual partnering for men and women. Multiple sexual partnering includes people who reported having sex with a person other than their spouse within the 12 months leading to survey. This category also includes all sexually active people who do not have a spouse or partner.

Age consistently has an inverted U–shaped relationship with multiple sexual partnering for both men and women at the individual level (see figures 4 and 5 below). There is no significant association with average age for either men or women at the neighborhood level, however.

Figure 4: U-Shaped Curve of Age and Multiple Sexual Partnering for Men

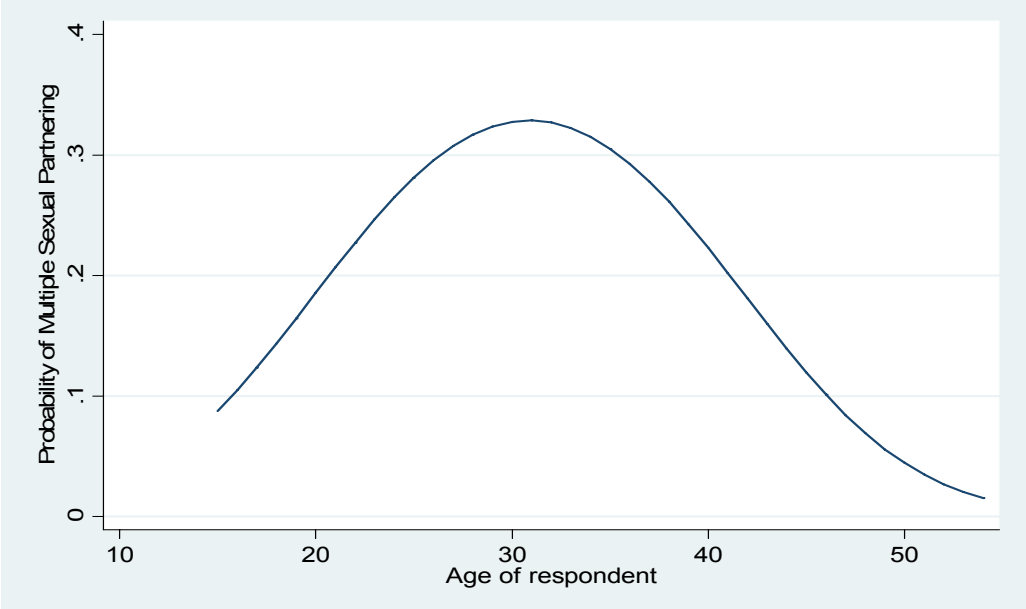


Figure 4 demonstrates the association between age and multiple sexual partnering for men. The trend of the curve is similar to the association between age and HIV testing (see figure 2) above. That is, the likelihood of engaging in multiple sexual partnering first increases with age, and then declines. The turning point for multiple sexual partnering is also between age 35 and 40.

Figure 5: U-Shaped Curve of Age and Multiple Sexual Partnering for Women

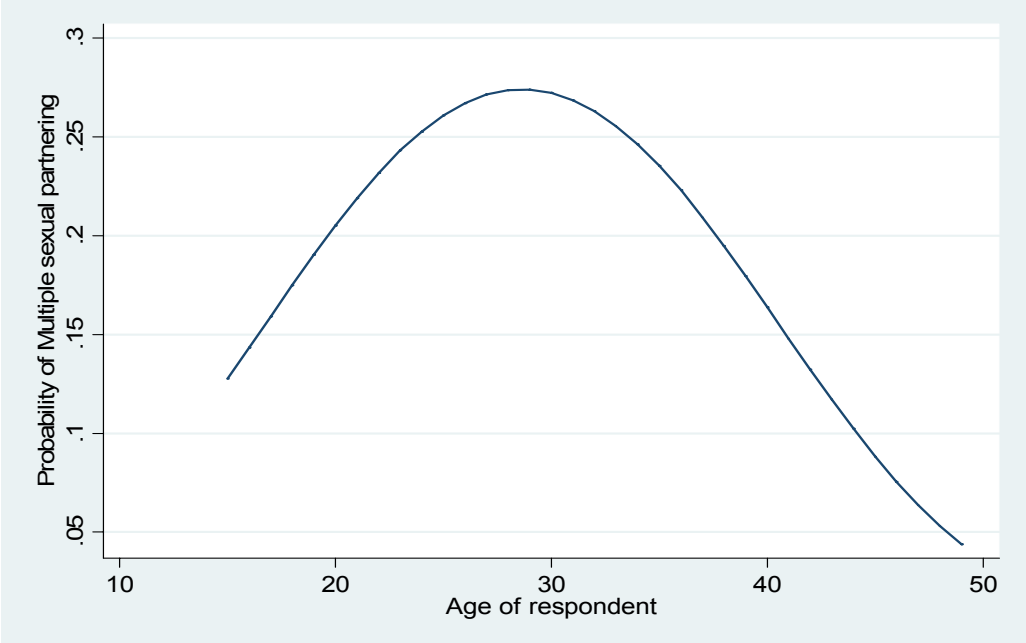


Figure 5 shows the association between age and multiple sexual partnering for women, and the trend is similar to the men's trend for multiple sexual partnering (see figure 4 above). The turning point is somewhat lower among men, but for both, the shape of the relationship is probably associated with the dynamics of marriage in Uganda. Uganda has a very low age of first marriage of 18. Many women find themselves in

relationships with men at a young age, get children, and then go through a separation. A lot of these women will tend to postpone committing themselves to a permanent marital relationship again, yet staying sexually active - - and will tend to engage in multiple sexual partnering. Uganda also has a large number of young women and men between the ages of about 25 and 30 who have postponed marriage, however. It is possible that this population of unmarried women and men explains the shape of the curve in figures 4 and 5 above. As these individuals continue to progress in age, it is expected that they will settle into stable relationships of marriage, which eventually reduce multiple sexual partnering. The turning point for men is about between ages of 35 and 40 and for women around age 30 – and studies out of Uganda, such as that by Green (2003), show that HIV infection rates are highest within the age range of 25 – 35.

Marital status is significantly associated with multiple sexual partnering for both men and women. That is, the odds of married men engaging in multiple sexual partnering or extra-marital sex are 80% lower than that of unmarried men, while the odds of married women engaging in extramarital sex or multiple sexual partnering are reduced by 95%. Although these figures look quite large, it may be understandable in this case, for two primary reasons: First, in the construction of the multiple sexual partnering measure/variable, sex between respondents who are married or partnered is not considered multiple sexual partnering. It is only the sex they have with someone other than their spouse/partner that is considered in the multiple sexual partnering category. For those who are not married or partnered, however, any sex they have counts as multiple

sexual partnering, and thus included in the category, for both men and women. Second, sexual behavior is self-reported, and many people consider it private, and get quite shy to talk about it openly and candidly. Indeed, some studies have found conflicting reports on sexual behaviors between husbands and wives, leading to the suspicion that some behaviors are not truthfully reported (Gersovitz, 2005). In contrast to marital status effects at the individual level, at the community level, marriage composition has no significant association with multiple sexual partnering for either women or men.

Socioeconomic status also shows a strong association with multiple sexual partnering among men at both the individual and neighborhood levels, while it only predicts multiple sexual partnering at the neighborhood level among women. For men, socioeconomic status at the individual level reduces the odds of men engaging in multiple sexual partnerships by an estimated 38% per one unit increase in socioeconomic status. This is contrary to commonly held beliefs that men who have money tend to use their financial power to indulge in multiple sexual partnerships by buying sex from sex-workers, as well as luring innocent school girls who need money to survive.

It is worth noting, however, that socioeconomic status is significantly associated with multiple sexual partnering among both men and women at the neighborhood level. A one unit increase in neighborhood socioeconomic status increases the odds of engaging in multiple sexual partnerships by 23% among men, and 16% among women. It is also important to note that increase in socioeconomic status among men at the individual level reduces the chances of engaging in multiple sexual partnering (table 9), yet the opposite

happens at the neighborhood level, where men's chances of engaging in multiple sexual partnering increase as average community socioeconomic status increases (table 9).That is, men in communities that are better off are more likely to engage in multiple sexual partnering, but richer men within a given community are less likely to engage in such risky behaviors than poorer men within the same community.

In the literature, however, the study of associations between socioeconomic status and HIV infection-risk in the developing world has often produced mixed results. While some studies have found clear inverse relationships (e.g., Fenton, 2004), others have found positive associations between HIV infection risk and socioeconomic status (e.g., Tanzania Commission for AIDS and ORC Macro, 2003; see also Popper, 2003 and Shelton, 2005). This complicates the debates within the donor world, where an argument has been convincingly made that risky sexual behavior is, to a large extent, a function of poverty – and any interventions to mitigate the HIV/AIDS epidemic must simultaneously address poverty.

Other religion has significant relationships with multiple sexual partnering among men and women at the individual level, reducing the odds of engaging in multiple sexual partnering in each case. In other words, other religion, as compared to Muslim religion, has a protective effect against the risky behavior of engaging in multiple sexual partnering among men and women. At the community level, other religion is not significantly associated with multiple sexual partnering for women. However, it is significantly associated with multiple sexual partnering among men, whereby belonging

to a neighborhood that predominantly identifies with other religion increases the odds of engaging in multiple sexual partnering. This is in contrast to Christianity (Protestant and Catholic) which has no significant association with multiple sexual partnering among men at the individual level, and no association among women at both the individual and neighborhood levels. This might be explained in two different ways.

First, many of the people who are likely to consider themselves traditionalists or belonging to no religion in Uganda also tend to be very conservative with a strong commitment to traditional family values of togetherness and community - and are usually polygamous[4]. In such traditional households, multiple sexual partnering, in terms of engaging in sexual behavior with someone other than your spouse/partner is quite minimal, and a taboo. Traditional family bonds (with a lot of emphasis on holding the extended family together) are usually very strong, and undesirable conduct may be punished in extended family gatherings. This cohesiveness of traditionalists' families provides protection against potentially dangerous practices. This might probably also explain why rural areas have the least reported cases of HIV infection throughout the developing world where HIV/AIDS is rampant.

Second, the positive association between multiple sexual partnering and other religion observed among men at the community level, might be explained by a different set of the people who are likely to consider themselves traditionalists: This set is mostly

[4] Uganda has three legal forms of marriage: - customary, civil, and church marriages. In customary marriage arrangements, husbands are considered the decision makers and breadwinners for the family – and the general philosophy is that a man can have as many wives as he can afford to take care of.

made up people with a very liberal mindset, many of whom have even given themselves new names, throwing out the religious names (such as Christian names), given to them by their parents as children. These tend to be well educated, urban/semi-urban residents, and in places relatively high influence, financially and politically, and they are not a small minority to be ignored. They tend to have high levels of anti-colonial sentiments. People in this category will tend to refer to themselves as traditionalists, because they do not subscribe to what they call western beliefs based in western religions, such as Christianity. As discussed earlier, although education supports protective behavior, it is also associated with the risky behavior of multiple sexual partnering. It is likely that communities with a high composition of residents who espouse this kind of philosophy will exhibit different behavior than their fellow traditionalists discussed above.

Neighborhood religious composition (Protestant and Catholic) is significantly associated with multiple sexual partnering for men. However, neither Catholic nor Protestant affiliation predicts multiple partnering for men on the individual level; furthermore, neither of the two Christian religious affiliations predicts such behavior on either individual or neighborhood level among women. If it is true that the teachings of the Catholic and Protestant Churches play a major role in influencing the sexual practices of their members as it is normally argued--and some researchers have found evidence supporting this claim, such as Lagarde et al. (2000)–and that women in general tend to take religious teachings more seriously than men, then these findings go against normative wisdom. Future research will need to test this argument further.

Educational attainment is significantly associated with multiple sexual partnering among men at both the individual and community levels. At the individual level, my model predicts an increase in the odds of engaging in multiple sexual partnering by 4% per one year increase in education. At the community level, a one year increase in average education attainment in a community among men increases the odds of engaging in multiple sexual partnering by 20% (see table 9). Although there is no statistically significant association between education attainment and multiple sexual partnering among women at the individual level, at the community level, the odds of engaging in multiple sexual partnering among women are increased by 13% per one year of increase in average educational attainment of women in a community (see table 10).These findings are consistent with existing research on multiple sexual partnering among men in sub-Saharan Africa (De Walque, 2006; Fenton, 2004). While educational attainment provides strong protective behavior in terms of encouraging consistent condom use and taking an HIV test, it has been found to increase the likelihood of infidelity or multiple sexual partnering among men (De Walque, 2006). This might be due to the social networks and other opportunities of bonding with other people that the school environment and workplace provide. It is not surprising, therefore, that education consistently increases chances of multiple sexual partnering among men at both the individual and community levels, as well for women at the community level. Education is not, however, significantly associated with multiple sexual partnering among women at the individual level.

Rural residence reduces the odds of engaging in multiple sexual partnering among men, but it is not significantly associated with multiple sexual partnering among women (see tables 9 and 10) – illustrating that, among men, the likelihood of residents of rural communities engaging in multiple sexual partnering or infidelity is lower compared with those living in urban communities. It is not clear why there is no significant association for women. This is a question that needs to be addressed in future research on women and the HIV infection-risk behavior of multiple sexual partnering.

Overall, it appears that many factors that predict multiple sexual partnering among men do not predict such behavior among women. It might be due to the possibility that most Ugandan women (with the exception of sex workers) tend to consider men who engage them in sexual affairs their husbands (since even the local languages do not have terminology for a girlfriend or a casual partner) – and it is customary for men to have several women whom they seldom visit for sexual purposes without declaring them wives. Therefore, what is considered multiple sexual partnering among women might be different from what men consider it to be.

Domestic violence tolerance is significantly associated and significantly increases the odds of engaging in multiple sexual partnering among men, at the individual level (see table 9) but it does not have a significant association with multiple sexual partnering among men at the neighborhood level – and no association at all among women at both the individual and neighborhood levels (see table 10). The finding that espousing domestic violence tolerance sentiments increases the odds of men engaging in multiple

sexual partnering might be because men who espouse notions of domestic violence have low regard for women – thus cheating on their wives/ permanent partners without remorse, and can change sexual partners as frequently as they desire. It is also important to note that there is no association between domestic violence tolerance and multiple sexual partnering at the community level (for both men and women – see tables 9 and 10), reinforcing the conclusion that domestic violence tolerance might be a phenomenon among individual men, which may not be sustainable or generalizeable to community level.

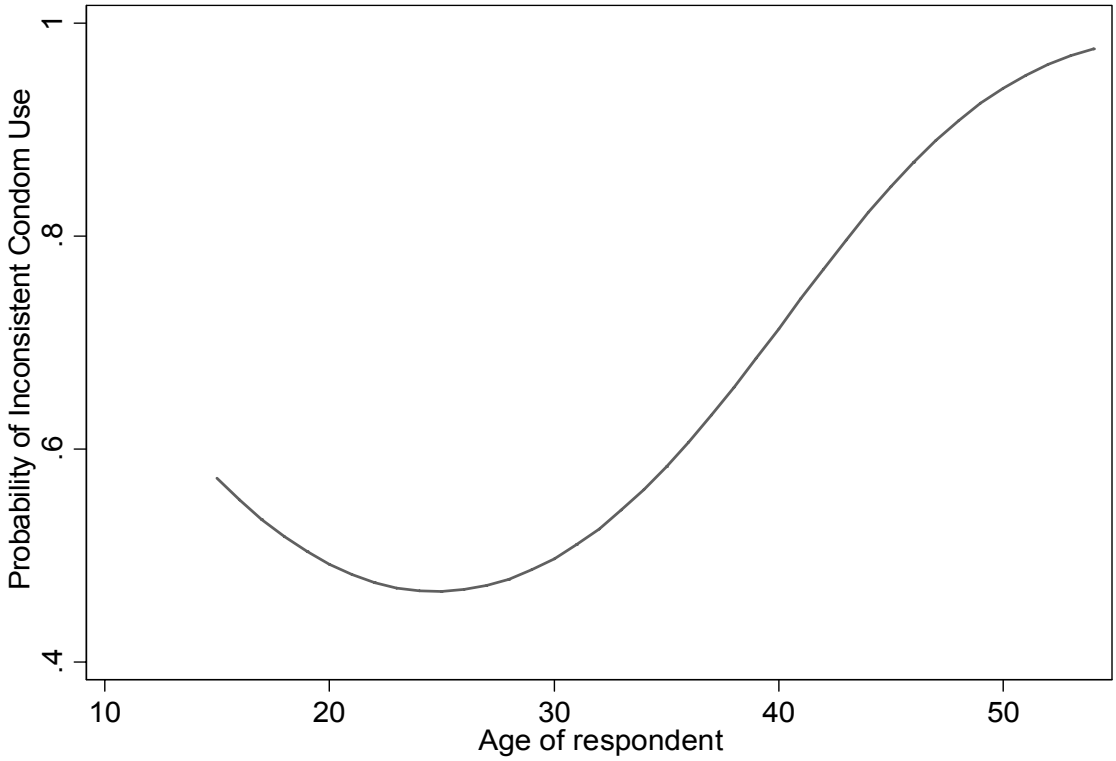
Inconsistent Condom Use

In tables 11 and 12, I present results of multilevel logistic regression for inconsistent condom use.

Consistent with findings on HIV testing and multiple sexual partnering, age is significantly associated with inconsistent condom use at the individual level among women and among men (tables 11 and 12). The shape of this relationship differs by gender, however. Among women, a one year increase in age increases the odds of inconsistent condom use by 5%. Among men, however, the association between age and inconsistent condom use is curvilinear (see figure 6 below). Unlike the U-shaped curves between age and HIV testing, and age and multiple sexual partnering discussed earlier in this chapter -- which show inverted relationships -- the curvilinear relationship between age and inconsistent condom use exhibits a central band, between about ages of 20 and

30, in which there are low levels of inconsistent condom use, but at either end of the age range, risk of inconsistent use is high. These findings, which suggest young men between the ages of 20 and 30 are less likely to be inconsistent condom users, or more likely to use condoms consistently, are not surprising when compared to earlier studies on condom use and age among men (Rotermann et al., 2009). At the community level, there is no association between community age and condom use behavior in both men and women.

Figure 6: <u>Men's Curvilinear Curve of Age and Inconsistent Condom Use</u>



Educational attainment is another strong predictor of inconsistent condom use among men and women – indeed, the most consistent predictor, both at the individual and neighborhood levels. Individuals with higher levels of education are less likely to be inconsistent condom users, compared to those with lower levels of education - and communities with highly educated residents have lower rates of inconsistent condom users – the odds of inconsistent condom use are reduced by 21% among men and 30% among women per one year increase in average education. That is, those who live in communities with a higher concentration of educated people are more likely to be consistent condom users than those living in communities of residents with lower levels of education. In contrast to education, socioeconomic status is not significantly associated with inconsistent condom use among men and women, at both the individual and community levels.

Marital status reduces the odds of inconsistent condom use among individual men, but has no association with condom use among individual women - - and at the community level, community marriage composition has no association with inconsistent condom use among either men or women. Domestic violence tolerance has no significant association with inconsistent condom among men and women, at either the individual or neighborhood levels. Place of residence, which is a neighborhood predictor, also has no association with inconsistent condom use among either men or women.

Catholic and Protestant men and women do not differ from Muslim men and women in terms of inconsistent condom use, at the individual level (see tables 11 and

12). At the community level, however, religious composition, in terms of Catholic and Protestant community members, shows no significant association with inconsistent condom use among women, which is consistent with findings elsewhere in this analysis: That is, it also had no significant association with either the protective practice of taking an HIV test or the HIV infection risk behavior of multiple sexual partnering. Religious composition on the community level, however, is significantly associated with inconsistent condom use among men – whereby those who live in communities with higher concentrations of Catholic and Protestant residents are more likely to be inconsistent condom users than those who live in communities with lower concentrations of Catholics and Protestants (see tables 11 and 12). Other religion has no association with inconsistent condom use among both men and women at the community level. That is, in terms of other religion, there is no relationship between religious composition of communities and the protective practice of condom use among both men and women.

Summary of Findings

Overall, educational attainment stands out – predicting protective practices in terms of condom use and HIV testing. It predicts strong reductions in inconsistent condom use among men and women at both the individual and neighborhood levels. Education also strongly predicts increasing levels of taking HIV tests among men and women at both individual and community levels. These findings would suggest that enhanced investments in education (in terms of years of schooling) will go a long way in

helping to reduce the risk of HIV infection. However, education predicts higher levels of infidelity or multiple sexual partnering – which is a high risk factor for HIV infection. It seems, therefore, the HIV infection-risk reduction through education may not be operating by changing the intensity and frequency of people's sexual practices, but by giving them access to prevention messages. Findings on condom use suggest that highly educated people have clearly heard HIV prevention messages promoting condom use as a safe instrument against HIV infection. An effective education curriculum, therefore, will need to include more than studying academic subjects – it will have to include sex education.

Socioeconomic status predicts mostly men's behavior, particularly multiple sexual partnering, with mixed results at the individual and community levels. While socioeconomic status reduces risk at the individual level, it encourages risk when aggregated to the community level. This is a surprising finding – but it is difficult to make much of it, given the low quality of the DHS data on socioeconomic status used in this analysis. I intend to pursue this question in more detail in the near future.

Religion is another important factor, strongly associated with HIV testing and multiple sexual partnering. This finding should encourage HIV prevention interventions to work closely with religious leaders in the campaign against the epidemic.

Other important associations have been found with age for men and women, marital status, and place of residence. For example, age has a distinct U-shaped relationship with multiple sexual partnering, whereby the odds of engaging in the risky

behavior of multiple sexual partnering increase with age, until about age 35, and then start declining for both men and women (see figures 4 and 5); Those who are married/partnered are less likely to engage in multiple sexual partnering than their unmarried/unpartnered counterpart (see tables 9 and 10); and residents of rural communities are less likely to engage in multiple sexual partnering than their urban counterparts (see tables 9 and 10).

Overall, the analysis demonstrates important associations between socio-demographic characteristics and practices/behaviors related to HIV infection risk, both at the individual and neighborhood levels. This should help to inform ongoing research on HIV prevention on the importance of background or contextual characteristics in determining who gets infected, and how and when people get infected with HIV. Prevention interventions need to take a more holistic approach, shifting away from the traditional preoccupation with individual behavioral factors as primary causal factors of HIV infection, without taking into consideration, the wider community context, which ultimately affects individual behavioral choices.

Table 7: Multilevel Logistic Regression Results of HIV testing for Men

	Coefficient	Odds Ratio	Standard Error
Individual Characteristics			
Age	0.034**	1.035	0.013
Age Squared	-0.439**	0.645	0.098
Education	0.153**	1.165	0.019
Socioeconomic Status (log)	0.181	1.198	0.351
Married or Partnered	0.362	1.436	0.212
Domestic Violence Tolerance	-0.339	0.712	0.214
Catholic	-0.014	0.986	0.293
Protestant	-0.176	0.839	0.318
Other Religion	-0.986	0.373	0.874
Neighborhood Characteristics			
Average Age	0.037	1.038	0.028
Average Age Squared	-0.004	0.996	0.003
Place of Residence (1= rural)	-0.248	0.780	0.194
Average Education	0.184**	1.202	0.044
Average Socioeconomic Status	0.157	1.170	0.091
Proportion Married or Partnered	-0.746	0.474	0.576
Proportion Domestic Violence Tolerance	0.509	1.664	0.336
Proportion Catholic	-0.385	0.681	0.500
Proportion Protestant	0.151	1.163	0.550
Proportion Other Religion	1.281	3.602	1.374
Intercept	-2.237**	0.107	0.312

Notes:
Statistical significance is indicated as follows: * $p \leq .05$; ** $p \leq .01$; *** $p \leq .001$

Table 8: Multilevel Logistic Regression Results of HIV testing for Women

	Coefficient	Odds Ratio	Standard Error
Individual Characteristics			
Age	0.023**	1.023	0.006
Age Squared	-0.288**	0.750	0.068
Education	0.137**	1.147	0.014
Socioeconomic Status (log)	0.159	1.172	0.146
Married or Partnered	0.227**	1.255	0.108
Domestic Violence Tolerance	-0.072	0.931	0.106
Catholic	-0.274**	0.760	0.126
Protestant	-0.326**	0.722	0.147
Other Religion x 10	-0.001	0.999	0.023
Neighborhood Characteristics			
Average Age	-0.046	0.955	0.027
Average Age Squared	-0.005	0.995	0.007
Place of Residence (1= rural)	-0.472**	0.624	0.146
Average Education	0.240**	1.271	0.034
Average Socioeconomic Status	0.014	1.014	0.062
Proportion Married or Partnered	0.196	1.216	0.409
Proportion Domestic Violence Tolerance	-1.040**	0.353	0.308
Proportion Catholic	-0.117	0.890	0.362
Proportion Protestant	-0.368	0.692	0.359
Proportion Other Religion x 10	0.062	1.064	0.050
Intercept	-2.466**	0.085	0.160

Notes:
Statistical significance is indicated as follows: * $p \leq .05$; ** $p \leq .01$; *** $p \leq .001$

Table 9: Multilevel Logistic Regression Results of Multiple Sexual Partnering for Men

	Coefficient	Odds Ratio	Standard Error
Individual Characteristics			
Age	0.023**	1.024	0.009
Age Squared	-0.645**	0.525	0.096
Education	0.042**	1.043	0.019
Socioeconomic Status (log)	-0.485**	0.616	0.196
Married or Partnered	-1.634**	0.195	0.187
Domestic Violence Tolerance	0.452**	1.571	0.157
Catholic	-0.114	0.892	0.220
Protestant	-0.026	0.974	0.229
Other Religion	-1.241**	0.289	0.575
Neighborhood Characteristics			
Average Age	-0.010	0.990	0.023
Average Age Squared	-0.002	0.998	0.002
Place of Residence (1= rural)	-0.609**	0.544	0.158
Average Education	0.066**	1.068	0.032
Average Socioeconomic Status	0.206**	1.229	0.080
Proportion Married or Partnered	0.182	1.200	0.469
Proportion Domestic Violence Tolerance	-0.480	0.619	0.261
Proportion Catholic	-1.026**	0.358	0.406
Proportion Protestant	-1.016**	0.362	0.429
Proportion Other Religion	1.563**	4.775	0.781
Intercept	-0.735**	0.479	0.246

Notes:
Statistical significance is indicated as follows: * $p \leq .05$; ** $p \leq .01$; *** $p \leq .001$

Table 10: Multilevel Logistic Regression Results of Multiple Sexual Partnering for Women

	Coefficient	Odds Ratio	Standard Error
Individual Characteristics			
Age	0.013**	1.013	0.005
Age Squared	-0.509**	0.601	0.063
Education	0.008	1.008	0.013
Socioeconomic Status (log)	0.166	1.181	0.127
Married or Partnered	-2.910**	0.054	0.151
Domestic Violence Tolerance	0.080	1.084	0.092
Catholic	0.151	1.163	0.151
Protestant	-0.104	0.901	0.172
Other Religion x 10	-0.092**	0.912	0.029
Neighborhood Characteristics			
Average Age	-0.032	0.969	0.030
Average Age Squared	0.003	1.003	0.006
Place of Residence (1= rural)	-0.239	0.787	0.176
Average Education	0.124**	1.132	0.041
Average Socioeconomic Status	0.149**	1.161	0.075
Proportion Married or Partnered	0.692	1.998	0.602
Proportion Domestic Violence Tolerance	0.513	1.670	0.294
Proportion Catholic	-0.160	0.852	0.449
Proportion Protestant	-0.464	0.629	0.458
Proportion Other Religion x 10	0.051	1.052	0.075
Intercept	-0.981**	0.375	0.167

Notes:
Statistical significance is indicated as follows: * $p \leq .05$; ** $p \leq .01$; *** $p \leq .001$

Table 11: Multilevel Logistic Regression Results of Inconsistent Condom Use for Men

	Coefficient	Odds Ratio	Standard Error
Individual Characteristics			
Age	0.039	1.040	0.021
Age Squared	0.451**	1.569	0.197
Education	-0.106**	0.899	0.046
Socioeconomic Status (log)	-0.196	0.822	0.418
Married or Partnered	-0.679**	0.507	0.288
Domestic Violence Tolerance	0.586	1.798	0.310
Catholic	-0.405	0.667	0.407
Protestant	-0.482	0.618	0.394
Other Religion	0.656	1.927	0.972
Neighborhood Characteristics			
Average Age	-0.031	0.969	0.039
Average Age Squared	0.001	1.000	0.005
Place of Residence (1= rural)	0.489	1.631	0.303
Average Education	-0.242**	0.785	0.069
Average Socioeconomic Status	-0.025	0.976	0.139
Proportion Married or Partnered	1.066	2.903	0.688
Proportion Domestic Violence Tolerance	-0.226	0.797	0.522
Proportion Catholic	2.206**	9.075	0.870
Proportion Protestant	2.045**	7.729	0.882
Proportion Other Religion	0.868	2.382	1.710
Intercept	-0.052	0.950	0.394

Notes:
Statistical significance is indicated as follows: * $p \leq .05$; ** $p \leq .01$; *** $p \leq .001$

Table 12: Multilevel Logistic Regression Results of Inconsistent Condom Use for Women

	Coefficient	Odds Ratio	Standard Error
Individual Characteristics			
Age	0.050**	1.052	0.012
Age Squared	0.045	1.046	0.133
Education	-0.120**	0.887	0.029
Socioeconomic Status (log)	-0.078	0.925	0.308
Married or Partnered	0.304	1.356	0.272
Domestic Violence Tolerance	0.181	1.198	0.192
Catholic	-0.070	0.933	0.258
Protestant	0.079	1.082	0.285
Other Religion x 10	0.135**	1.144	0.059
Neighborhood Characteristics			
Average Age	0.054	1.055	0.046
Average Age Squared	-0.002	0.998	0.012
Place of Residence (1= rural)	-0.108	0.897	0.241
Average Education	-0.356**	0.700	0.064
Average Socioeconomic Status	0.147	1.158	0.103
Proportion Married or Partnered	-0.686	0.504	0.795
Proportion Domestic Violence Tolerance	0.660	1.935	0.565
Proportion Catholic	1.374	3.952	0.728
Proportion Protestant	0.997	2.711	0.727
Proportion Other Religion x 10	0.167	1.182	0.114
Intercept	0.508**	1.663	0.254

Notes:
Statistical significance is indicated as follows: * $p \leq .05$; ** $p \leq .01$; *** $p \leq .001$

CHAPTER SIX: DISCUSSION AND CONCLUSIONS

The goals of this study were to contribute to the efforts of refocusing HIV prevention research and policy debates from the largely behavioral approach that has dominated the field for the last three decades to a more comprehensive approach that takes contextual factors into account, to identify vital contextual factors that put individuals in situations that ultimately increase susceptibility to HIV infection, and to use the unique UDHS 2000-2001 dataset as a source for understanding the contextual factors in HIV transmission in Uganda, which, with its relatively reduced AIDS prevalence, might serve as a model for other developing nations. The success of the Uganda model in reducing the prevalence of HIV/AIDS is generally attributed to preventive measures, in particular, multimedia informational programs, the provision of condoms, and cooperation among government, NGOs, the World Health Organization (WHO), as well as religious and community-based organizations (CBOs). The provision of testing for HIV infection is an added factor, but one that has been largely limited to urban areas.

In this chapter, I discuss key findings of the research, the strengths and limitations of the data, and the policy implications and recommendations suggested by the research, regarding ongoing Ugandan efforts for HIV infection mitigation and prevention. The purpose of the study was to examine the influence of individual and community characteristics on Human Immunodeficiency Virus (HIV) infection-risk and protective behaviors in Uganda. Due to limitations of data availability, three behaviors (HIV testing,

multiple sexual partnering, and condom use among non-cohabiting partners) were considered for the analysis.

This study is based on a conceptual model derived from structuration theory (Giddens, 1979, 1984; Cloke et al., 1991; Link & Phelan, 1995). Throughout the study, I hypothesize HIV infection risk and protective behaviors to be influenced by contexts in which people live – thus examining the effects of contextual factors on individual behaviors that ultimately expose people to HIV infection or protect them from it. Individual socio-demographic and community-level characteristics were analyzed in terms of their influence on HIV infection-risk and protective behaviors (inconsistent condom use, multiple sexual partnering, and HIV testing,). To achieve the goals of the study, I conducted multilevel (two-level) logistic regression analyses. Multilevel logistic regression analyses provided information on the extent to which individual characteristics and community characteristics affect engagement in HIV infection-risk and protective behaviors. The study took advantage of the socio-demographic and HIV infection-risk behavior data in the 2000/01Uganda Demographic and Health Survey, collected by the Uganda Bureau of Statistics and Macro International Inc.

Key Findings

Several findings can be generalized and are important for policymakers engaged in controlling the HIV/AIDS epidemic. Educational attainment is an important factor which supports some protective behaviors, but it is also associated with some risky behavior, especially among men. It is a consistent predictor of HIV testing among men

and women, at both the individual and community levels. Education also reduces inconsistent condom use for both individual men and women, and average education at the community level reduces inconsistent condom use for men and women. With regard to multiple sexual partnering, however, individual education has no signification association among women, but it increases multiple sexual partnering among men. At the community level, average education is associated with increasing levels of multiple sexual partnering among both men and women.

Age is another important predictor, particularly as it relates to HIV testing and multiple sexual partnering, among both men and women. For both individual men and women, age has an inverted U-shaped relationship with HIV testing (figures 2 and 3), with multiple sexual partnering (Figures 4 and 5). The association between age and inconsistent condom use, however, is U-shaped among men (figure 6), but not among women. Among women, a 1 year increase in age increases the odds of inconsistent condom use by 5%.

Socioeconomic status is significantly associated with multiple sexual partnering among men at the individual level – predicting a decrease in the odds of engaging in multiple sexual partnering as levels of socioeconomic status rise (table 9), and has an opposite effect at the community level - - where an increase in average socioeconomic status increases the odds of engaging in multiple sexual partnering among men. And while socioeconomic status has no significant association with multiple sexual partnering among women at the individual level, there is a significant association at the community level, whereby the odds of engaging in multiple sexual partnering increase as the level of

socioeconomic status rises (table 10). These findings are surprising and have serious implications for HIV prevention efforts, particularly in the presence of strong arguments in development and epidemiological literature that poverty makes individuals susceptible to health risky behavior, such as engaging in multiple sexual partnerships. The Uganda data suggest that education can be associated with both risk-reducing and risk-enhancing behavior, in direct contradiction of rational choice theory. They also suggest complexity in the reckoning of the mortal risks associated with HIV transmission that has been implied in other literature on the developing world.

In fact, research on the associations between socioeconomic status and HIV infection-risk in the developing world has often produced mixed results. While some studies have found clear inverse relationships (e.g., Fenton, 2004), others have found positive associations between HIV infection-risk and socioeconomic status or wealth (e.g., Tanzania Commission for AIDS and ORC Macro, 2003; see also Popper, 2003 and Shelton, 2005). Just like the data used in this analysis, the Tanzanian study measured socioeconomic status in terms of physical characteristics of the household and household possessions, and the results indicated a strong positive relationship between HIV prevalence and socioeconomic status. Regardless, these findings call for: (1) Increased consideration and study of the economic dynamics of sexual risk in a wide variety of HIV interventions, especially behavior change interventions; and (2) employing more appropriate research designs that take into account both the protective and potentially hazardous effects of community contexts. For example, in the model of multiple sexual partnering for women (table 10), there is no statistically significant effect of

socioeconomic status at the individual level, yet at the neighborhood level, the association is significant. This calls for further analysis and follow-up exploration.

Overall, these findings highlight the importance of shifting bases in the campaign against the HIV/AIDS epidemic from sexual behavior as the culprit that needs to be confronted by intervention efforts to socio-demographic characteristics which ultimately influence and determine sexual behavior. Indeed, previous studies and intervention policies have tended to concentrate on sexual behaviors as the major influences affecting HIV infection – and this has disproportionately skewed intervention efforts towards sex education and personal sexual behavior change. But this has taken attention away from real-life social norms and contextual disadvantages that ultimately determine sexual behaviors. In his 1999 book "Freedom as Development" (1999), Amartya Sen writes at length about "capability deprivation"—the extent to which entire communities can lose options for basic well-being, including health. Sen recommends it to be a better measure of poverty than income, because it can capture the health risk aspects of poverty hidden by income measures. In a developing nation like Uganda, capability deprivation is among the primary disabling factors imbedded in the contexts of living for ordinary people. While Uganda has made important strides toward economic growth, according to official reports of both government and the World Bank (World Bank, 2008), majority of the general population still lives below or at the margins of the poverty line, and this is a deprivation that filters into and immobilizes people's capabilities in key areas of empowerment, such as education and health care. Disease prevalence itself can multiply disadvantage. Indeed, other reports note that, in Uganda, HIV/AIDS is likely to increase

the percentage of people living in extreme poverty by as much as 6 percentage points between 2000 and 2015 (UNDP, 2003).

The particular and rising vulnerability of women and girls to HIV infection makes it important to understand how social factors may be influencing their self-protective decisions. Regarding HIV testing, increased education appears to increase women's choice to be informed about their health status. Stable marital status also appears as a contributing factor, suggesting self-protective actions that can reduce HIV transmission risks. However, social pressures may be working against some women with regard to testing. For example, Catholic and Protestant women may be dissuaded, more than their Muslim counterparts, from seeking blood tests to assess HIV infection because of church attitudes and values that need further evaluation.

One of the advantages of the UDHS data is that they provided more input from rural areas and from rural women in particular, on risky behavior. For rural women, it is likely that the lack of testing behavior reflects both social sanctions and the lack of availability of such tests outside urban areas. The data also suggest that the rural community acts to diminish multiple sexual partnering (for men). The role of customary norms, apart from Catholic and Protestant religious beliefs, may be important.

At higher socioeconomic levels of communities, women and men alike, appear likely to engage in sexual activity with multiple sexual partners, suggesting that community factors can override otherwise rational estimates of the risks of HIV transmission. It is possible that this association of socioeconomic status with multiple

sexual partnering is linked to enhanced social networks and a false sense of feeling sheltered from risky networks of friends.

The tolerance for domestic violence appears to influence men's tendency towards multiple sexual partners, not a surprising result. Regarding Christian religious composition of communities (Catholic and Protestant), data suggest that religious norms may have an effect on restraining multiple sexual partnerships among men. At the same time, however, these norms also increase inconsistent condom use.

Program Priorities for HIV Prevention in Uganda

Having laid the groundwork for preventing HIV transmission, Uganda is well positioned to improve its programs in ways that would address the dimensions of problems revealed in this dissertation project.

To begin, while more education increases protective behavior for individuals and their neighborhoods, it fails to inform them about the full range of risks, for example, those associated with multiple sexual partners. The need for sex and health education as part of general education appears patently necessary. Simply advocating condom use or HIV testing can lull the public into a false sense of safety about HIV transmission and about sexually-transmitted diseases in general. The various organizations involved at present in educating the public should extend their efforts to standard school curricula, which, as development proceeds, can also rely more on televised and electronic communication.

While I was not able to obtain data on sex education to use side by side with educational attainment for comparison purposes, educational attainment has a lot of influence on sexual behavior. Enhanced investments in secondary and tertiary education for both men and women should go a long way to help in the eradication of HIV. Future studies might benefit from testing interaction effects between socioeconomic status and educational attainment in predicting HIV infection-risk behaviors, such as multiple sexual partnering.

The targeting of the most vulnerable populations should also be given priority. Young people are a crucial audience for educational campaigns, yet, outside formal education, in poor and rural districts, they can be the most difficult to reach and influence. The use of community-level organizations, church organizations, and other informal social groups may prove the best avenues of communication. Young men and boys are themselves vulnerable and they also increase the risks for their partners. As in most developing nations, young people under 25 constitute a significant part of the population. The future prevalence of AIDS cannot be diminished without addressing their needs.

Younger women constitute another vulnerable population, as reflected in the rise in HIV infection rates among them in recent years. The analysis in this thesis suggests that Catholic and Protestant women may be caught up in difficult—but not unfamiliar—dilemmas regarding norms against seeking protective information regarding sexual activity. Religious interdictions against birth control methods, including condoms, have fostered abstinence campaigns as alternatives. But the data in the Uganda survey indicate

that Catholic and Protestant men, while they may feel constraints against multiple sexual partners, use condoms inconsistently and may therefore pose preventable risks to their partners. These data underscore the importance of secular government informational campaigns and school curricula in discouraging health risky behavior.

The poor in both urban and rural settings constitute other populations at risk from a lack of information and resources. Since Uganda is predominantly a rural agricultural country, the government has made significant efforts for informational outreach beyond Kampala. It may be that customary norms in rural communities have been inconsistent with the central government's messages regarding safe sex. The stability of those communities, in the face of intermittent armed conflict in border areas and with increased economic development, could have an adverse effect on risky behavior, in the absence of concerted investment in education and health care options.

Data Limitations and Suggestions for Future Research

The 2000/01 Uganda Demographic and Health Survey included generally accepted behavioral HIV infection-risk indicators (HIV testing, multiple sexual partnering, and condom use) for a nationally representative sample of the population. The inclusion of these measures of HIV infection–risk is an important addition to Demographic and Health Surveys, because it is an additional tool that allows assessing causal relationships and associations between behavior and the spread of the HIV/AIDS epidemic. The 2008 UDHS, not as yet available for analysis, will allow a comparative overview of the problems addressed in this thesis.

While having socio-demographic and HIV infection-risk behavioral data in the 2000/2001 Uganda Demographic and Health Survey is an important and helpful development, one major limitation is that sexual behaviors are self-reported, and there are usually many problems associated with self-reported data (Gersovitz, 2005). The survey, which was recording fertility statistics, also emphasized heterosexual unions and ignored HIV infection risk behavior as related to homosexual relations. Nor did the survey concern itself with sex workers of both genders and their potential roles in HIV/AIDS prevalence.

Another shortcoming is that the data is cross-sectional, whereas behavioral change observations, particularly on subjects as private and as culturally guided as sex, require longer periods of time. The symptoms of AIDS itself may not emerge in an individual for years, which can complicate understandings of risky sexual behavior. The data leaves unexplored as well the social experience of AIDS in Uganda—the sudden rise in deaths and orphaned and infected children against a backdrop of other infectious diseases, such as malaria, also associated with poverty. Furthermore, the data by itself cannot take into account the mobility of various populations, especially to and from urban areas. The trend in developing countries is for young men in particular to migrate to urban areas, where their networks and behaviors can significantly change. We know all too little about the health risk behaviors of impoverished urban dwellers, men and women alike, until they appear as mortality statistics.

In future years, as the Uganda effort to reduce HIV transmission continues, it should be possible to address these limitations by conceptualizing the contextual

influences which shape behavior and thereby improving the collection of data to inform policy. While it has been argued that the AIDS epidemic is different across Africa and in other nations, its structural features do appear comparable. Poverty and a lack of education are generally associated with the epidemic's spread. Factors of age and gender and also religion are also fundamental to analysis.

The findings in this study should not be taken to imply causal relationships, but nevertheless point to important associations that can help inform HIV prevention efforts and policy formulation. These associations clearly show certain aspects of livelihoods, such as gender, poverty and low levels of education persist in putting some categories of the population at greater risk—thus calling for specific prevention interventions to be directed to them.

Future research will benefit from a more detailed analysis of a complex web of socio-demographic influences, taking into account potential interactions, such as interaction between socioeconomic status and educational attainment, and examining how these affect HIV-infection risk. It will also be important to explore similar questions as pursued in this analysis with panel data to examine changes in behavior which is not possible with cross-sectional data. It is also important to examine different contexts (nations and/or regions of the world affected by HIV/AIDS).

Overall, advancing the field in ways suggested by Farmer (2003:39) remains an important goal. By opening a door to the possibilities of contextual influences on HIV transmission, the actor-in-context paradigm that has informed the analyses in this thesis is intended to advance thinking about HIV infection-risks and how to diminish them. The

complexities of HIV transmission in Uganda and the rest of the developing world continue to be affected by structural patterns of development that increase educational and socioeconomic benefits but also expose individuals and communities to destabilizing social factors which increase health risks.

Since the 2000-2001 Uganda Demographic and Health Survey, however, an entire new initiative to introduce antiretroviral treatment, sponsored notably by the Bill and Melinda Gates Foundation, with cooperation from the U.S. government, WHO, and NGOs, demands a new appreciation of how to combine preventive programs with post-infective interventions. To be sure, this is a welcome imitative. But exactly who will benefit from medical interventions remains unclear, although it is likely that inequalities will emerge between those who are educated and of higher socioeconomic status and those who are not. Religion and rural-urban differences may also play a role in determining what populations benefit most. How the combination of prevention programs and medical interventions will impact the prevalence of HIV infection among women also remains to be seen. The hope is that Uganda can provide a model that addresses the vulnerabilities of both poverty and gender in reducing the prevalence of AIDS.

BIBLIOGRAPHY

Abraham, C., Sheeran, P., Orbell, S. (1998). Can social cognitive models contribute to the effectiveness of HIV preventive behavioral interventions? A brief review of the literature and a reply to Joffe (1996; 1997) and Fife-Schaw (1997). *The British Journal of Medical Psychology,* 71(3), 297-310.

Adebiyi, A., and Vivekananda, F. (1991). AIDS in third world countries: What are the alternatives. *Scandinavian Journal of Development Alternatives, 10*(1-2), 91-99.

Adetunji, J. (2000). Condom use in marital and nonmarital relationships in Zimbabwe. *International Family Planning Perspectives*, 26(4), 196-200.

Adih, W. K., and Alexander, C. S. (1999). Determinants of condom use to prevent HIV infection among youth in Ghana. *Journal of Adolescent Health*, 24(1), 63-72.

Agha, S. (1998). Sexual Activity and Condom Use in Lusaka, Zambia. *International Family Planning Perspectives,* 24 (1), 32-37.

Andersson, N., Ho-Foster, A., Mitchell, S., Scheepers, E., and Goldstein, S. (2007). Risk factors for domestic physical violence: national cross sectional household surveys in eight southern African countries. *BMC Women's Health,* 1472 (6874), 7-11.

Arroyo, M.A., Hoelscher, M., Sateren, W., Samky, E., Maboko, L., Hoffmann, O., Kijak, G., et al. (2005). HIV-1 diversity and prevalence differ between urban and rural areas in the Mbeya region of Tanzania. *AIDS,* 19(14):1517-1524.

Asiimwe-Okiror, G., Opio, A.A., Musinguzi, J., Madraa, E., Tembo, G., and Carael, M.(1997). Change in sexual behavior and decline in HIV infection among young pregnant women in urban Uganda. *AIDS*, 11(14), 1757-1763.

Azabo, J. (1989, April 13). Lutaaya has AIDS. *New Vision*, P.1

Baguma, A. (2005, October 21). Ugandans are too many to get rich. *The New Vision*, P.1

Bandura, A. (1977). *Social Learning Theory.* Englewood Cliffs: Prentice Hall.

Beyth-Marom, R., Austin, L., Fischhoff, B., Palmgren, C., and Jacobs-Quadrel, M. (1993). "Perceived consequences of risky behaviors: Adults and adolescents." *Developmental Psychology,* 29 (3), 549-563.

Blalock, H. M. (1984). Contextual-effects models: theoretical and methodological issues.

Annual Review of Sociology, 10, 353–72.

Blanc, A. K. (2000). The Relationship between sexual behavior and level of education in developing countries. *UNAIDS –Best Practice Digest.* Geneva: Switzerland, P.3

Blanc, A. K., and Way, A. A. (1998): Sexual behavior and contraceptive knowledge and use among adolescents in developing countries. *Studies in Family Planning*, 29 (2):106 -116.

Blumer, H.(1969). *Symbolic Interactionism: Perspective and Method*. Englewood Cliffs: Prentice Hall.

Breslow, N.E., and Clayton, D.G. (1993). Approximate inference in generalized linear mixed models. *Journal of American Statistical Association*, 88, 9-25.

Bryk, A.S., and Raudenbush, S.W. (1992). *Hierarchical Linear Models*. Newbury Park: Sage.

Burdick,R.K., and Graybill,F.A. (1988). The Present Status of Confidence Interval Estimation on Variance Components in Balanced and Unbalanced Random Models, in *Communications in Statistics: Theory and Methods,* 17:1165-1195.

Burstein, L., Fischer, K.H., and Miller, M.D. (1980). The multilevel effects of background on science achievement: a cross-national comparison. *Sociology of Education,* 53, 215-225.

Campbell, C. (2003). *Letting them die: Why HIV/AIDS prevention programs fail*. Bloomington: Indiana University Press.

Caldwell, J., Caldwell, P., and Quiggin, P. (1989). The social context of AIDS in sub-Saharan Africa. *Population and Development Review,* 15 (2), 185-234.

Caprara, A., Seri, D., De Gregorio, G.C., Parenzi, A., Salazar, C.M., and Gozé, T. (1993). The perception of AIDS in Bete and Baoule of the Ivory Coast. *Social Science and Medicine*, 36(9), 1229 – 1235.

Carael, M, and Holmes, K. K. (2001). Dynamics of HIV epidemics in sub-Saharan Africa: Introduction. *AIDS,* 15 (Suppl 4): S1–S4.

Cloke, P., Philo, C., and Sadler, D. (1991). *Approaching human geography*. London: Paul Chapman.

Cockerham, W. C., and Ritchey, F. J. (1997). *Dictionary of medical sociology*. London: Westwood Press.

_____. (2005). Health lifestyle theory and the convergence of agency and structure. *Journal of Health and Social Behavior,* 46 (1), 51 – 67.

Cohen, D. (1993). *The HIV epidemic in Uganda: A program approach.* Kampala: UNDP.

Coleman, J. (1990). *Equality and achievement in education*. Boulder, Colo.: West View.

Deininger, K. (2001). *Uganda's agricultural sector 1992 to 2000: Accomplishments and challenges*. Washington DC: World Bank.

DeWalque, D. (2002*). How does the impact of an HIV/AIDS information campaign vary with educational attainment? Evidence from rural Uganda*. World Bank Policy Research working paper number 3289. Washington, DC.: World Bank

_____.(2006). *Who Gets AIDS and How? The determinants of HIV infection and sexual behaviors in Burkina Faso, Cameroon, Ghana, Kenya, and Tanzania.* World Bank Policy Research working paper number 3844. Washington, DC.: World Bank

Diez Roux, A.V. (2001). Investigating neighborhood and area effects on health. *American Journal of Public Health*, 91(11), 1783-1789.

_____. (2003). The examination of neighborhood effects on health: conceptual and methodological issues related to the presence of multiple levels of organization. In: Berkman L, ed. *Neighborhoods and Health.* New York: Oxford University Press. PP. 45-64.

Duncan, C., Jones, K., and Moon, G. (1998). Context, composition, and heterogeneity: using multilevel models in health research. *Social Science and Medicine*, 46 (1), 97–117.

Dunkle, K. L, Jewkes, R.K, and Brown, H. C. (2004). Gender-based violence, relationship power, and risk of HIV infection in women attending antenatal clinics in South Africa. *The Lancet*, 363 (9419), 1415-21.

Dunkle, K.L., Jewkes, R.K., Nduna, M., Levin, J., Jama, N., Khuzwayo, N., MP Koss, M. P., Duvvury, N. (2006). Perpetration of partner violence and HIV risk behavior among young men in the rural Eastern Cape, South Africa. *AIDS,* 20, 2107-2114

Durkheim, E. 1951 (1897). *Suicide*. Glencoe, IL: Free Press.

Eckholm, E. (1990, September 19). Confronting the cruel reality of Africa's AIDS epidemic. *The New York Times*.

Farmer, P. (2001): *Infections and inequalities: The modern plagues*. California: University of California Press.

Farmer, P., Lindenbaum, S., and Delvecchio-Good, M.J. (1993). Women, poverty and AIDS: An introduction. *Culture, Medicine and Psychiatry,* 17 (4), 387-397.

Farmer, P., Connors, M., and Simmons, J. (1996). *Women, poverty, and AIDS: sex, drugs, and contextual violence*. Monroe, ME: Common Courage Press.

Fee, E. & Krieger, N. (1993). Understanding AIDS: historical interpretations and the limits of biomedical individualism. *American Journal of Public Health*, 83(10), 1477-86.

Fenton, L. (2004). Preventing HIV/AIDS through poverty reduction: The only sustainable solution? *Lancet,* 364 (9440), 1186–1187.

Filmer, D. and. Pritchett, L.H. (2001). Estimating Wealth Effects Without Expenditure Data—Or Tears: An Application to Educational Enrollments in States of India. *Demography,* 38 (1), 115–32.

Fishbein, M., and Ajzen, I. (1975). *Belief, attitudes, intention, and behavior: an introduction to theory and research.* Reading, MA, Addison-Wesley.

Fitzgerald, D.W., Behets, F., Caliendo, A., Roberfroid, D., Lucet, C., Fitzgerald, J.W., and Kuykens, L. (2000). Economic hardship and sexually transmitted diseases in Haiti'srural Artibonite Valley. *American Journal of Tropical Medicine and Hygiene*, 62 (4), 496–501.

Gersovitz, M. (2005). The HIV epidemic in four African countries seen through the demographic and health surveys. *Journal of African Economies,* 14 (2), 191- 246.

Giddens, A. (1984). *The constitution of society*. Berkeley: University of California Press.

_____. (1984). *The Constitution of society: outline of the theory of structuration*. Cambridge: Polity Press.

Glick, P. and Sahn, D.E. (2008). Are Africans practicing safer sex? Evidence from

demographic and health surveys for eight countries. *Economic Development and Cultural Change*, 56 (2):397–439.

Government of Uganda. (2010). UNGASS country progress report: Uganda. Kampala.

Goldstein, H., and Rasbas, J. (1996). Improved approximations for multilevel models with binary responses. *Journal of the Royal Statistical Society*, 159 (3), 505-513.

Gray, P. B. (2004). HIV and Islam: Is HIV prevalence lower among Muslims? *Social Science and Medicine*, 58(9): 1751-1756

Grulich, A. E., and Kaldor, J.M. (2000). Evidence of success in HIV prevention in Africa. *Lancet*; 360 (9326), 3-4.

Guo, G., and Zhao, H. (2000). Multilevel modeling for binary data. *Annual Review of Sociology,* 26, 441-462

Gupta, G.R., Parkhurst, J.O., Ogden, J. A., Aggleton, P., and Mahal, A. (2008). Structural approaches to HIV prevention. *The Lancet*, 372, 764-775.

Hallman, K. (2004). *Socioeconomic Disadvantage and Unsafe Sexual Behaviors Among Young Women and Men in South Africa.* Working Paper No. 190, Population Council.

Hechter, M. and Kanazawa, S.. (1997). Sociological Rational Choice Theory. *Annual Review of Sociology,* 23, 191 – 214.

Heffernan, C. (2002). HIV, sexually transmitted infections and social inequalities: When the transmission is more social than sexual. *International Journal of Sociology and Social policy*, 22 (4/5/6), 159 – 176.

Hooper, E. (1990). *Slim: A Reporter's Own Story of AIDS in East Africa*. London: Bodley Head.

_____. (1990, July 7). AIDS epidemic moves south through Africa. *New Scientist*. Retrieved from: http://www.newscientist.com

Hox, J.J. (2002). *Multilevel analysis: techniques & applications*. Routledge Academic.

Hunter, S., Bulirwa, E., and Kisseka, E. (1993). AIDS and agricultural production: Report of a land utilization survey, Masaka and Rakai districts of Uganda. *Land Use Policy,* 10(3), 241-58.

Kalichman, S. C., Ntseane, D., Nthomang, K., Segwabe, M., Phorano, O., and Simbayi, L. C. (2007). Recent multiple sexual partners and HIV transmission risks among people living with HIV/AIDS in Botswana. *Sexually Transmitted Infections*, 83, 371-375.

Kamali, A., Carpenter, L.M., Whitworth, J.A.G., Pool, R., Ruberantwari, A., and Ojwiya, A. (2000). Seven year trends in HIV-1 infection rates and changes in sexual behavior among adults in rural Uganda. *AIDS*, 14 (4), 427–443.

Kamali, A., Quigley, M., Nakiyingi, J., Kinsman, J., Kengeya-Kayondo, J., Gopal, R., et al. (2003). Syndromic management of sexually-transmitted infections and behavior change interventions on transmission of HIV-1 in rural Uganda: A community randomized trial. *The Lancet,* 361(9358), 645- 652.

Kayeyi, N., Sandy, I.F., and Fylkesnes, K. (2009). Effects of neighborhood-level educational attainment on HIV prevalence among young women in Zambia. Public Health, *BMC Public Health*, 9, 310. Retrieved from: http://www.biomedcentral.com/1471-2458/9/310/

Kenya Ministry of Health. (2001). AIDS in Kenya: background, projections, impact, interventions and policy, sixth edition. Nairobi: *National AIDS and STD Control*.

Khobotlo, M.(2009). *Lesotho: HIV prevention response and modes of transmission analysis.* Maseru, Lesotho National AIDS Commission.

Koenig, H. G., McCullough, M. E., and Larson, D. B. (2001*). Handbook of religion and health*. New York: Oxford University Press.

Krieger, N. (2001). A glossary for social epidemiology. *Journal of Epidemiology and Community Health*, 55 (10), 693-700

Kuther, T. L. (2002). Rational decision perspectives on alcohol consumption by youth revising the theory of planned behavior. *Addictive Behavior,* 27(1), 35-47.

Lagarde, E., Auvert, B., Chege, J., Sukwa, T., and Glynn, J. R. 2001. Condom use and its association with HIV/sexually transmitted diseases in four urban communities of sub-Saharan Africa. *AIDS,* 15(suppl 4), S71- 78.

Lemelle, A.J., Harrington, C., & LeBlanc, A.J. (2000). *Readings in the sociology of AIDS*. New Jersey: Prentice Hall.

Link, B.G., and Phelan, J. (1995). Social conditions as fundamental causes of disease. *Journal of Health and Social Behavior* (special issue), 80-90.

Luke, D. A. (2004). *Multilevel modeling.* Thousand Oaks, CA: Sage

Marum, E. (1993). *The HIV/AIDS epidemic and U.S. AID strategy*. Kampala, Uganda.

Mbulaiteye, S.M., Mahe, C., Whitworth, J.A.G, Ruberantwari, A., JS Nakiyingi, J.S., Ojwiya, A., and Kamali, A. (2002). Declining HIV-1 incidence and associated prevalence over 10 years in a rural population in south-west Uganda: A cohort study. *Lancet,* 360 (9326), 41-46.

Moatti, J.P., Souteyrand, Y., Prieur, A., Sandfort, T. and Aggleton, P. (2000). *AIDS in Europe: New Challenges for the Social Sciences*. London: Routledge.

Morgenstern, H. (1995) Ecologic studies in epidemiology: concepts, principles and methods. *Annual Review of Public Health,* 16, 61-81.

Mulder, D., Nunn, A., Kamali, A., and Kengeya-Kayondo, J. (1995). Decreasing HIV-sero-prevalence in young adults in rural Ugandan cohort. *British Medical Journal,* 11(7009), 833–836.

Mutangadura, G., Mukurazita, D., and Jackson, H. (1999*). A Review of household and community coping responses to the HIV/AIDS epidemic in the rural Areas of sub-Saharan Africa*. UNAIDS, Best Practice Paper. Retrieved from: www.unaids.org

Nabaitu, J., Bachengana, C., and Seeley, J. (1994). Marital instability in a rural population in South-West Uganda-implications for the spread of HIV-1 infection. *Africa,* 64 (2), 243-251

Odebiyi, A., and Vivekananda, F. (1991). AIDS in Third World countries: what are the alternatives. *Scandinavian Journal of Development Alternatives,* 10 (1), 91- 99.

Parker, G. and Klein, C. (2000). Structural barriers and facilitators in HIV prevention: a review of international research. *AIDS*, 14 (Suppl1), S22-32

Phelan, J., and Link, B.G. (2010). Social conditions as fundamental causes of health inequalities: theory, evidence, and policy implications. *Journal of Health and Social Behavior*, 51(suppl 1), S28-S40.

Philipson, T., and Posner, R. (1995). On the microeconomics of AIDS in Africa. *Population and Development Review*, 21 (4), 835-848.

Popper, K. (2003). *All life is problem solving*. New York: Routledge.

Prochaska, J.O., and DiClemente, C.C. (1983). Stages and processes of self -change of smoking: Toward an integration model. *Journal of Consulting and Clinical Psychology,* 51(3), 390- 395.

Raudenbush, S.W., and Bryk, A.S. (2002). *Hierarchical Linear Models, (2nd Ed.*). Newbury Park: Sage.

Rauh, V. A., Andrews, H. F., and Garfinkel, R. (2001). The contribution of maternal age to racial disparities in birth weight: A multilevel perspective. *American Journal of Public Health*, 91 (11), 1815–1824.

Republic of Uganda. (n.d.). *Guidelines for resistance committees on the control of AIDS: Action for Survival, directorate of information and mass mobilization.* Ministry of Health, Kampala.

Robert, S. (1999). Socioeconomic position and health: The independent contribution of community socioeconomic context. *Annual Riverview of Sociology*, 25, 489–516.

Rotermann, M., and McKay, A. (2009). Condom use at last sexual intercourse among unmarried, not living common-law 20- to 34-year-old Canadian young adults. *Canadian Journal of Human Sexuality*, 18 (3): 75 - 87

Sen, A. (1999). *Freedom as development*. Oxford: Oxford University Press.

Serwadda, D., Sewankambo, N.K., Carswell, J.W., Bayley, A.C., Tedder, R.S., Weiss, R.A., and Mugerwa, R.D., et al. (1985). Slim disease: A new disease in Uganda and its association with HTLV-III infection. *Lancet,* 2(8460), 849-852

Shelton,J. D., et al. (2005). Is poverty or wealth at the root of HIV? *Lancet*, 366 (9491), 1057-1058

Snijders, T. A. B., and Bosker, R. J. (1999). *Multilevel analysis: An introduction to basic and advanced multilevel modeling*. Thousand Oaks, CA: Sage.

Sumartojo, E. (2000). Structural factors in HIV-prevention: Concepts, examples, and implications for research. *AIDS,* 14(suppl 1), S3-S10.

Susser, M. (1994). The logic in ecological: I. The logic of analysis. *American Journal of Public Health*, 84 (5), 825–829.

Tanzania Commission for AIDS and ORC Macro. (2003).*Tanzania HIV/AIDS indicator survey 2003-04*. Retrieved from: http://www.tgpsh.or.tz/uploads/media/2006-4-12-7-15-46_tanzania_hiv-aids_indicator_survey_2003-04.pdf

Tarantola, D. and Schwartlander, B. (1997). HIV/AIDS epidemics in sub-Saharan Africa: Dynamism, diversity, and discrete declines. *AIDS*. 11 (Suppl B), S5-S21.

The AIDS Support Organization (TASO). (1999*). Operational strategy and plan of action, January 1999 to December 2002.* TASO, Kampala.

The Star. (1985, October 9). *Aids a challenge to witchdoctors*. P. 4

_____. (1985, December 16). *Ugandan Doctors reveal Slim, AIDS similarity*. P.3.

_____. (1984, December 29). *Mysterious Disease Kills 100 People in Rakai*. P.1

Uganda Bureau of Statistics (UBOS) and Macro International. (2001). *Standard Demographic and Health Survey Report* (DHS), 2000-01.

Uganda Ministry of Health (MoH). (1991). AIDS Surveillance Report. Kampala: Ministry of Health.

United Nations Development Program (UNDP). (2003). *Millennium Development Goals: A Compact among Nations to End Human Poverty.* New York: Oxford University Press.

United Nations Program on AIDS (UNAIDS). (2002). *Report on the global AIDS epidemic.* Geneva: UNAIDS.

_____. (2004). *Report on the global AIDS epidemic.* Geneva: UNAIDS.

_____. (2008). *Report on the global AIDS epidemic.* Geneva: UNAIDS.

_____. (2009). *Report on the global AIDS epidemic.* Geneva: UNAIDS.

Webb, D. (1997). *HIV and AIDS in Africa*. Chicago IL: Pluto Press.

Weber, M. (1958 (1905)). The *Protestant ethic and the spirit of capitalism*. New York: Scribners.

Williams, G. H. (2003). The Determinants of health: Structure, context, and agency. *Sociology of Health and Illness*, 25 (3), 131 – 154.

World Bank. (2008). *Global Economic Prospects 2008: Technology Diffusion in the Developing World.* Washington, DC: World Bank.